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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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Contents Page 241

THE
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THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

VOL. 22 NEW YORK, JUNE, 1924 No. 6

American Electro-Platers' Society Convention

A Description of the Plating Industry of Milwaukee, Wis., the Convention City, and Advance Information About the Twelfth Annual Convention

Written for The Metal Industry by L. WEGNER, Milwaukee, Wis.

When the Electro-Platers' Society convenes in Milwaukee June 30th for its annual convention, members of the trade will have their first general opportunity to get a first hand view of a city which is not only one of the most important convention cities in the world, but which ranks as a center for the electro-platers art.

Six of the larger shops specializing in electro-plating work will be visited by convention delegates during the session. A partial list of shops in which electro-plating is done contains more than two dozen names of firms of the first magnitude.

HOTEL PFISTER, MILWAUKEE, WIS.

Not only is Milwaukee one of the largest industrial centers in the United States, but it is also known as the city which produces a greater diversity of products.

Milwaukee, it is not generally realized, is primarily a manufacturing city. Because it was identified so long with the brewing industry, many would be extremely surprised to learn that beer was never a ranking Milwaukee product. The metal trades industry leads all others in the value of products, and is followed by food, leather, textiles, chemical and drug, and wood products. Beer did not rank with these even in its palmiest days.

With the great diversity of manufactured products, Milwaukee finds extensive use for electro-plating. It is used extensively in silverware, phonograph records, hardware, locks and safes, electrical appliances, buttons, table lamps, metal trimmings of every description and an endless line of metal goods that require a fine finish.

The several hundred electro-platers from all parts of the United States and Canada who will attend the convention will find a warm and sincere welcome in store for them if preparations under way count for anything.

Not only are Milwaukee members of the trade working diligently to make the convention a long-to-be remembered success, but the Association of Commerce and other civic bodies are already making plans for the entertainment of the visitors. Milwaukee a few weeks ago began a campaign to extend its prominence as a convention center, as a result of which business men and citizens generally are determined to add their personal efforts toward making conventions in the city complete successes.

The history of one branch of Milwaukee's manufactures, is the history of nearly all. As an illustration of their rapid growth from a start made years ago in a small way by men of limited capital and experience, the art of electro-plating is a case in point.

The most striking example is that of the S. K. Williams Company. Established in 1875 by H. N. Davis, it was probably the pioneer job-electro-plating concern in the city, and flourished until today it is considered one of the largest and best equipped job-plating concerns in Milwaukee. In 1900 the business was taken over by S. K. Williams, and continued under private ownership until 1923, when it was incorporated with Mr. Williams as President and Treasurer, and Robert Steuernagel as Secretary. Trade increased so rapidly that greater facilities were required so the present company started a plant of its own at 850 32nd Street, and covers a total area of 12,000 square feet.

Undoubtedly, the largest and most complete plant in the neighborhood and possibly in the world is that of the Cutler-Hammer Manufacturing Company of Milwaukee, manufacturers of electrical controlling devices. Beginning in the year 1892, the Cutler-Hammer Manufacturing Com-

pany started in Chicago, with H. H. Cutler, as engineer, E. W. Hammer as promoter and W. S. Terry. The next year, 1893, the company incorporated under the laws of the State of Illinois. In 1899, the increasing business necessitating larger quarters, the move to Milwaukee was made. A large number of the Chicago employes came along and many of them, still members of the organization, are holding responsible positions. It is estimated that approximately 2,000 people are employed in all departments.

Mr. Cutler remained a Director and one of the Vice-President until a few years ago when he severed all connections with the firm. "C.-H." products, in less than thirty years, have gained world-wide recognition as the largest manufacturers of its kind. Pat Sheehan, a member of the Milwaukee Branch is in charge of the electro-plating department.

The Milwaukee Brass Manufacturing Company, with the plating and polishing room in charge of Wm. C. Brandt, was established in 1893, at a time when modern sanitary plumbing material as we know it today was just beginning to come into the market, and very early used electro-plating processes in their work.

This concern is the oldest member of the present National Association of Brass Manufacturers, which organization is largely responsible for the present day standardization of plumbers' brass goods. The personnel of the Milwaukee Brass Manufacturing Company, including all heads of departments as well as officers, has practically remained intact since its organization thirty-one years ago. They manufacture principally faucets and stop cocks which are shipped to all parts of the United States, Canada, Mexico and the Orient.

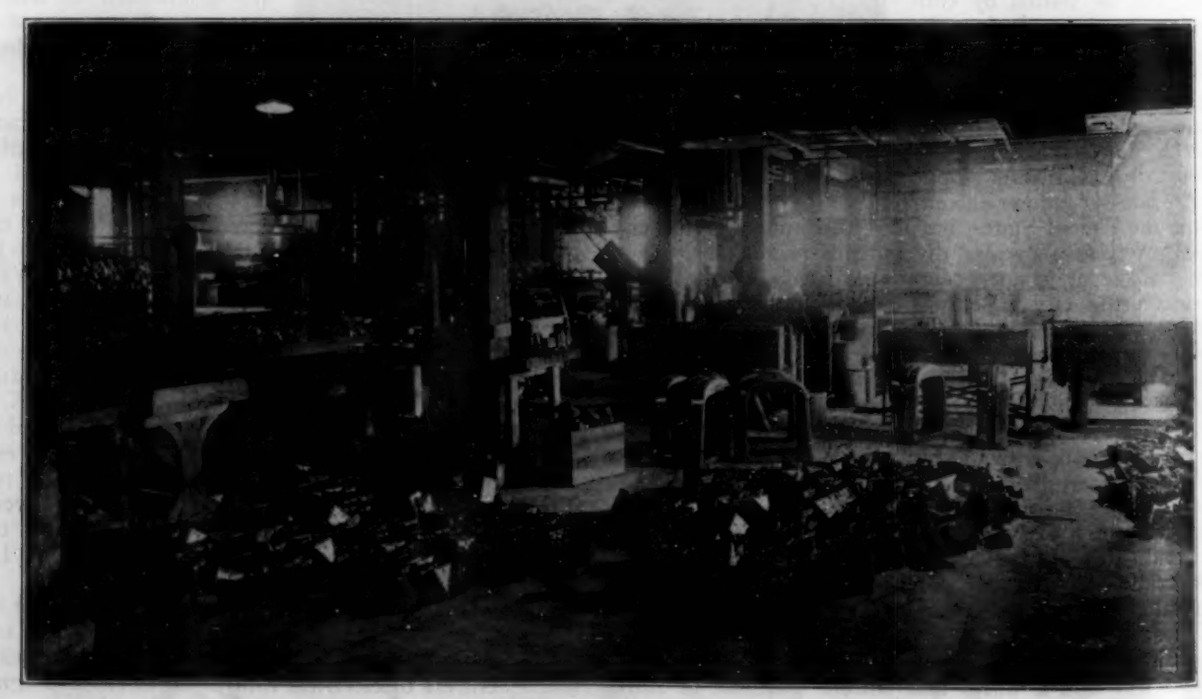
Very interesting is the history of the first automobile bumper, manufactured by the Gemco Manufacturing Company, at 742 South Pierce Street, in 1906 or 1907. The bumpers in use at that time were 1¼" round bars. Most of them were made of iron, lined brass tubing, highly polished. With the evolution of the automobile, however, there came the nickel plated parts of the car instead of brass, and a nickel-plating outfit was installed to take care of this work, now in charge of Martin Bilitz, member of the Milwaukee Branch. From time to time increased equipment was necessary, until, in 1923, operating at full capacity, it was found that the plating department was not adequate to take care of the increased volume, and in the early part of the year a large generator was added, which was capable together with the equipment on hand at that time, of producing 3,000 bumper bars per day.

A partial list of shops in which electroplating is done and member in charge is as follows:

Cutler Hammer Manufacturing Company, Pat Sheehan.
Clum Manufacturing Company, H. C. Hurtig, Paul Krause.
Badger Manufacturing Company, Frank Kakatsch.
Gemco Manufacturing Company, Martin Bilitz.
Milwaukee Stamping Company, Joe Birbaum.
Moe Bridges Company, Roy Hunt.
Milwaukee Brass Manufacturing Company, Wm. C. Brandt.
Milwaukee Dustless Brush Company, Joe Hornwall.
Milwaukee Valve Company, Louis Zingler.
Milwaukee Gas Specialty, Edward Wolff.
Rundle-Spence Company, Arthur Koehler.
E. R. Wagner Manufacturing Company, Ernie Jaeger.
Green Engraving Company, Ray Goodsell.
Racine Plating Company, M. Nishwitz.
Superior Plating Company, Edward Werner and John Hock.
Charles Polacheck, Stephen Verfurth.
Robinson Plating Works, Art Ruttan, A. J. Kraft.
Panay Show Case Company, J. B. Jensen.
Lindemann-Hoverson Company, M. Tonasi.
Johnson Service Company, Ted Hodan.
National Plating Works, John Muszewski, Joe Bykowski.
S. K. Williams Company, Robert Steuernagel.
Adolph Werner Company.
Wittig & Gehrke.
National Stamping & Enameling Company, A. Schmidt.
Fond du Lac Plating Company, W. Kielberg.
Quality Metal Finishing Company, A. C. Hintze.

HISTORY OF THE MILWAUKEE BRANCH

Organized in December, 1912, the Milwaukee Branch of the American Electro-Platers' Society now boasts of forty-three members. Through the courtesy of officials of Marquette University, a meeting hall was placed at the disposal of the new branch. Meetings were held monthly, when various problems of electro-plating were discussed.



WORK IN PROCESS AT S. K. WILLIAMS COMPANY, MILWAUKEE, WIS.

It very soon became evident that the platers' knowledge was too limited to bring all discussion to an enlightened conclusion, with the result that a class was formed to learn the chemistry of electro-plating. This class was under the able direction of A. E. Keinth, under whose tutelage the class made remarkable progress. Held in the basement of the home of one of the members, the class continued each year through the winter months, until recently the City of Milwaukee supplied a well equipped laboratory in the Continuation School Building for the experimenting on more economical and efficient methods of finishing metal products. The officers of the branch are as follows: Ray Goodsell, President; Henry Hurtig, Vice-President; Robt. Steuernagel, Secretary; Dan Wittig, Librarian; Frank Marx and Art Koehler, Board of Managers.

FACILITIES FOR CONVENTION

The Hotel Pfister, at which the convention will be held, is not only one of the most exclusive in the City and State, but is nationally known for its cuisine, the courteous treatment of its guests, and its wonderful furnishings. Visitors at the convention will find many hours of enjoyment viewing the superb art collection which is housed in the Hotel Pfister. This collection is composed chiefly of paintings.

Milwaukee is exceptionally desirable as a convention city during the summer months because of its proximity to Lake Michigan, and official weather reports show the climate here to be unequalled in any part of the United States during the hot months.

Within a radius of six blocks of the Hotel Pfister, are several first class hotels—Martin, Plankinton, Wisconsin, Medford, and a number of smaller ones, all with good accommodations. The local committee of the Milwaukee Branch requests that all members and guests report to the registration booth at the Hotel Pfister as soon as possible upon arrival in the city that they may be assigned without loss of time to the reservations. In addition to this the registrants will be given all the necessary tickets, badges and identification cards, including the general program of the business and entertainment features of the convention, together with guide books and information concerning the city.

CONVENTION SCHEDULE

The local convention committee has arranged a four-day program in which business and pleasure is mixed in a proportion which promises both an enjoyable and profitable time to those who attend the convention. Special attention will be given to the arrangement of features for the entertainment of the ladies, the plan being to provide something different each day. There will be trolley and automobile trips, shopping tours, luncheons and numerous other diversions to make the convention a long-to-be-remembered incident.

In order that the time devoted to business may be used exclusively for this purpose and that the necessary business of the convention may be concluded in the allotted time, the officials in charge of the program have issued an appeal to all delegates to be present at the business sessions exactly on time.

The convention committee has endeavored to keep in mind the fact that the purpose of the convention is, first of all, a serious effort to promote the best interests of the art of electro-plating. Invitations have been extended to a number of speakers of national reputation in connection with electro-plating to take part in the program.

Technical papers will be read by these men and discussions will be conducted by them afterwards.

Registration: The delegates will proceed to the Hotel Pfister immediately on arrival and will register at convention headquarters there. They will receive badges and identification cards and will be furnished with assistance in finding hotel accommodations. The Milwaukee Association of Commerce will provide circulars containing a description of points of interest in the city.

The initial session of the convention for Monday, June 30, has a program warranted to hold considerable interest for all members. Charles H. Proctor of New York, Founder of the Society and Plating-Chemical Editor of THE METAL INDUSTRY, and Walter J. Allen, of Grand Rapids, Mich., past president, are scheduled to deliver addresses. The address of welcome will be given by Ray Goodsell,

POLISHING DEPARTMENT, S. K. WILLIAMS COMPANY, MILWAUKEE, WIS.

President of the Milwaukee Branch. John E. Sterling of New York, Supreme President, will respond for the Society. Important topics will come up for discussion and legislation, such as the innovation of prize awards, and the cooperation of Branch Research Committees with the Bureau of Standards. The program, in detail, is as follows:

J. E. STERLING,
President

GENERAL PROGRAM

MONDAY, JUNE 30TH

9:00 A. M. Registration main floor Hotel Pfister. All members and guests are requested to register early as possible and obtain official badge, and convention tickets. Information gathering to renew acquaintance.

10:30 A. M. Meeting of the Executive Board in the secretary's quarters.

1:00 P. M. Meeting of the credentials committee in the secretary's quarters.

2:00 P. M. Convention called to order by Ray Goodsell, Pres. Milwaukee Branch.
Address of Welcome by John Niven, City Attorney.
Address by Frank Cleveland, Association of Commerce.
Address by Charles H. Proctor, New York, Founder of the Society.
Address by Walter J. Allen, Grand Rapids, Past Pres.
Response for the Society by John E. Sterling of New York, Supreme President.
Formal opening for business and seating of delegates, minutes of last meeting.
Reports of officers—Appointment of Committees by the president and submitting all resolutions and amendments in the supreme secretary's hands to the law committee for their recommendations at the final business meeting.

E. J. MUSICK,
First Vice-President

8:00 P. M. Meeting called to order by Pres. Sterling, who will read his annual address.
Papers: Progressive Production Methods as Applied to Finishing Departments, by C. Van Deran, Supervisor, Finishing Department, Westinghouse Electric Products Company, Mansfield, Ohio.
The Nickel Plating of Zinc Die Castings, by R. L. Shepard and B. E. Miller, Detroit, Mich.
The Manufacture of Varnish, Enamels and the Methods of Application, by H. G. Kittredge, Kay & Ess Paint Company, Dayton, Ohio.
Finishing of Statuary Bronze on Steel by A. Rickson, Grand Rapids, Mich.
The Use of a Distribution Box for Better Plating by B. F. Lewis, Detroit, Mich.

TUESDAY, JULY 1ST

9:00 A. M. Business session.

10:30 A. M. Board cars at Hotel for trip to Waukesha Beach. Convention picture will be taken immediately upon arrival, Geo. S. Carney, official photo.

12:30 P. M. Fish dinner—Fountain Dining Room. Steamboat ride on Lake Pewaukee, Bathing, Fishing, Dancing and Amusements. Ball Game—Western Champions, Rudy J. Hazucha, Capt.; Eastern Champions, Tom Trumbour, Capt.

5:30 P. M. Cars leave Waukesha Beach, arriving at Hotel Pfister 7 o'clock.

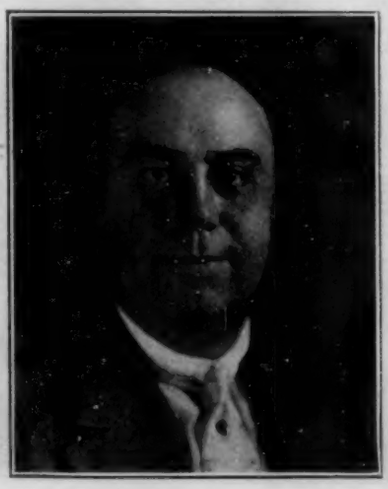
8:30 P. M. **Papers:** Do Pure Zinc Anodes Pay? by Oliver W. Storey, Burgess Laboratories, Madison, Wis.
Uniform Nickel Deposits, by E. W. Heil, Wichita, Kansas.
The Plater-Executive, by Francis Shepard.
Magnesium Sulphate in Nickel Solutions, by F. Menninges, St. Louis, Mo.
Calculating Resistance by the Fall of Potential Method, by F. Horath, St. Louis, Mo.

E. W. WOODMANSEE
Second Vice-President

WEDNESDAY, JULY 2ND

9:30 A. M. Visiting of industrial plants and shops, S. K. Williams Company, Cutler Hammer Manufacturing Company, Milwaukee Brass Manufacturing Company, Gemco Manufacturing Company, Badger Manufacturing Company, Clum Mfg. Co.

2:30 P. M. **Papers:** Report of the Work of the Bureau of Standards, by Dr. Wm. Blum.
Formulae and Platers by Pat Sheehan, Milwaukee, Wis.
Cooperation—A Factor of Production, by Walter J. Allen, Kieler Brass Company, Grand Rapids, Mich.
Brass Plating of Antimonial Lead, by Jose San Pedro, New York.
Future Possibilities of the American Electro-Platers' Society, by C. H. Proctor, New York.



F. W. HANLON,
Secretary-Treasurer

THURSDAY, JULY 3RD

8:30 A. M. Roll call

and final business session. Reports of committees and their findings. Election of Officers—Selecting of Convention City for 1925. Adjourning at noon.

1:30 P. M. Tour of city and places of interest, returning not later than 5:00 P. M.

6:30 P. M. Fern Room, Hotel Pfister—Banquet followed by installation of newly elected officers, introduction of new officers. Awarding of prizes by retiring President. Entertainment—Dancing.

LADIES' PROGRAM

9:30 A. M. Monday, June 30th—Reception, registration Hotel Pfister Lobby. Distribution of badges and tickets to all events—meet on mezzanine to renew acquaintances.

F. C. MESLE,
Editor, The Monthly Review

C. H. PROCTOR,
Founder

W. J. ALLEN,
Past President

2:30 P. M. Monday, June 30th—Shopping tour and visit to stores and Plankinton Arcade.

8:00 P. M. Monday, June 30th—Theatre Party (Wisconsin, Alhambra, Garden or Strand).

TUESDAY, JULY 1ST

10:30 A. M. Special cars or busses to Waukesha Beach. Convention pictures immediately on arrival. Geo. C. Carney, Photographer.

12:30 P. M. Dinner in Fountain Dining Room. Steamboat ride on Lake Pewaukee, Bathing, Dancing and Amusements.

5:30 P. M. Cars leave for return trip arriving at Hotel Pfister 7:00 o'clock.

Evening Card Party—Lunch.

WEDNESDAY, JULY 2ND

9:30 A. M. Visit to Public Museum—Visit to Gridley Dairy Company.

2:30 P. M. Take special cars to Washington Park Zoo, and Mitchell Park.

8:00 P. M. Visit theatre and Wisconsin Roof Garden.

THURSDAY, JULY 3RD

9:30 A. M. Visit Industrial Plants—Phoenix Knitting Works—Palmolive Soap Company—Johnston Candy Company.

1:30 P. M. Trip through parks and places of interest, returning not later than 5:00 o'clock.

6:30 P. M. Hotel Pfister Fern Room—Banquet—Reception to newly elected officers—Installation of officers—Entertainment.

The following firms will exhibit at the convention:

Apothecaries Hall Company, Waterbury, Conn.
Belke Manufacturing Company, Chicago, Ill.
Bias Buff & Wheel Company, New York, N. Y.
Crown Rheostat & Supply Company, Chicago, Ill.
Divine Brothers Company, Utica, N. Y.
Donald Sales & Manufacturing Company, Milwaukee, Wis.
Egyptian Lacquer Manufacturing Company, New York, N. Y.
J. B. Ford Company, Wyandotte, Mich.
Alfred Goethal Company, Milwaukee, Wis.
Hanson & Van Winkle Company, Newark, N. J.
Lasalco, Inc., St. Louis, Mo.
Maas & Waldstein Company, New York, N. Y.
Meaker Galvanizing Company, Chicago, Ill.
A. P. Munning & Company, Matawan, N. J.
Oakley Chemical Company, New York, N. Y.
George A. Stutz Manufacturing Company, Chicago, Ill.

A Short History of the American Electro-Platers' Society

By OSCAR E. SERVIS

In the annals of craftsmen's organization, the American Electro-Platers' Society is unique in its character. Its membership is composed chiefly of men who are either foremen, supervisors or technical men connected with, or in charge of electro-plating and finishing departments. These men are combined for educational purposes only, to improve quality and production as well as to find new ideas through research and investigation. The Society, since its inception, has been instrumental in the elevation of the art of electro-deposition, and has lifted the industry into the professional and scientific field.

The National Electro-Platers' Association was organized initially through the efforts of Charles H. Proctor, in 1908 in New York City, and until 1912 was the parent body when the Society was re-organized under the name of American Electro-Platers' Society and a supreme body elected. All branches are subordinate to the supreme Society and support it by paying a percapita tax. This provides for the salary of the Supreme Secretary-Treasurer, and the Editor (who are the only salaried officers) and the publication of the Monthly Review, which is the official organ of the Society, published monthly.

Twenty-four branches representing 1,200 members contribute to the maintenance of the Supreme Society which meets in convention each year, and acts as a clearing house for educational and business purposes. This

annual event is conspicuous in the activities within the Society throughout the year. Education, however, is paramount and in this we are ably assisted by the U. S. Bureau of Standards, which is represented at all conventions by men of high standing as educators and research workers in the electro-chemical industries.

We have a message to impart to the manufacturer and employer. If your foreman is not a member, urge him to become one. It is to your interest. To electro-platers present, who are eligible and not yet members, see the Secretary at once; become a member; you need the Society more than the Society needs you. The American Electro-Platers' Society is growing bigger each year and you will grow with it. Before long you will realize the benefits derived by becoming a member.

MEETINGS OF THE AMERICAN ELECTRO-PLATERS' SOCIETY

ANNUAL MEETINGS AND OFFICERS ELECTED

The American Electro-Platers' Society has been organized 15 years, the first three years as the National Electro-Platers' and twelve years as American Electro-Platers' Society.

The First Annual Convention was held in New York, February 22-23, 1913. Seven societies or branches formed the American Electro-Platers' Society, New York, Philadelphia, Chicago, Indianapolis, Rochester, Toronto and Detroit. Later St. Louis, Dayton, Milwaukee, Cincinnati, Newark and Bridgeport came in.

The Second Annual Convention was held June 4, 5 and 6, 1914, in Chicago, Ill., with the following officers:

President—Geo. B. Hogaboom.
Vice-President—J. H. Hansjosten.
Treasurer—M. Schultz.

Although only in its second year, there came to this convention of the Society delegates of 14 branches. Mr. Wheelock was present and even then invited the Society to San Francisco.

Officers elected were:

President—Col. J. H. Hansjosten.
1st Vice-President—W. S. Barrows.
2nd Vice-President—H. H. Williams.
Secretary—W. N. Fraine.
Treasurer—J. E. Sterling.
Editor—H. E. Wilmore.

The Third Annual Convention was held in Dayton, Ohio, June 3-4, 1915. Officers elected were:

President—W. S. Barrows.
1st Vice-President—H. H. Williams.
2nd Vice-President—W. G. Stratton.
Secretary-Treasurer—Walter Fraine.
Editor—J. H. Hansjosten.

Delegates from 17 branches attended. Dr. William Blum of the Bureau of Standards was there. Through the wonderful kindness of the National Cash Register Company, all the rest and recreation rooms of that Company were thrown open to the Convention. Charles H. Proctor, Founder was elected a Delegate at Large.

The Fourth Annual Convention was held July 6, 1916, in Cleveland, Ohio. A telegram was sent to the President of the United States offering the services of the Society. Officers elected were:

President—H. H. Williams.
1st Vice-President—W. D. Stratton.
2nd Vice-President—Oscar Servis.
Secretary-Treasurer—Walter Fraine.
Editor—H. J. Richards.

The Fifth Annual Convention was held July 5, 6, 7, 1917, in St. Louis, Mo. Delegates from 17 branches attended. O. E. Servis endeavored to start a branch in Minneapolis. The President of the United States was again offered the support of the Society.

F. C. Rushton of the St. Louis Branch, who was in the Service, appeared on leave, as a guest. A tablet of appreciation sent to W. S. Barrows for his able and unselfish work for the Society. Officers elected were:

President—Walter Fraine.
1st Vice-President—George B. Hogaboom.
2nd Vice-President—W. J. Salmon.
Secretary-Treasurer—Oscar E. Servis.
Editor—H. J. Richards.

The Sixth Annual Convention was held July 2-3, 1918, in Detroit, Mich. The following officers were elected:

President—W. Fraine.
1st Vice-President—S. P. Gartland.
2nd Vice-President—P. Uhl.
Secretary-Treasurer—O. E. Servis.
Editor—H. J. Richards.

The Seventh Annual Convention was held July 1, 2, 3, 1919, in Philadelphia, Pa. At this meeting the first lady —Miss Zalia Jenks—was elected a member of the Society. Officers elected were:

President—Oscar E. Servis.
1st Vice-President—S. P. Gartland.
2nd Vice-President—P. Uhl.
Secretary-Treasurer—J. E. Sterling.
Editor—H. H. Williams.

The Eighth Annual Convention was held June 30-July 1, 2, 3, 1920, in Rochester, N. Y. The Cincinnati delegation was not seated, and the Boston delegation was seated without power to vote. The question of admitting assistant foremen platers to membership came up at this meeting, and was defeated. Officers elected were:

President—S. P. Gartland.
1st Vice-President—P. Uhl.
2nd Vice-President—W. J. Allen.
Secretary-Treasurer—J. E. Sterling.
Editor—H. H. Williams.

The Ninth Annual Convention was held June 30-July 1, 2, 3, 1921, in Indianapolis, Ind. Twenty-four branches were represented. A revision of the constitution by the Past Presidents was ordered. Officers elected were:

President—P. Uhl.
1st Vice-President—S. E. Hedden.
2nd Vice-President—F. J. Hanlon.
Secretary-Treasurer—J. E. Sterling.
Editor—W. J. Allen.

The Tenth Annual Convention was held June 28, 29, 30-July 1, 1922, in Cincinnati, Ohio. A resolution adopted commending the Near East Relief Work. Another resolution was adopted thanking the Bureau of Standards. Letters of sympathy were sent to Dr. Blum, S. E. Hedden and M. G. Kopf, who were unable to attend because of illness and other misfortunes. The revised constitution was adopted by the assembled delegates of 24 branches. Officers elected were:

President—Walter J. Allen.
1st Vice-President—B. D. Aufderheide.
2nd Vice-President—John E. Garrick.
Secretary-Treasurer—F. J. Hanlon.
Editor—F. C. Mesle.

The Eleventh Annual Convention was held July 2, 3, 4, 5, 1923, in Providence, R. I. A novelty of the convention included a regular Fourth of July session and a patriotic address of Dr. Holyoke. More fireworks were set off consisting of the great display of Milwaukee talent in securing the 12th annual meeting of American Electro-Platers' Society. Officers elected were:

President—J. E. Sterling.
1st Vice-President—E. J. Musick.
2nd Vice-President—E. W. Woodmansee.
Secretary-Treasurer—F. J. Hanlon.
Editor—F. C. Mesle.

Recent Progress in Electroplating and Electroforming

A Brief Review of the Developments of Interest to the Electroplating and Electroforming Industries During the Post-War Period[1]

By W. BLUM[2]

No attempt will be made to include an exhaustive bibliography or discuss critically the individual researches. Instead, an effort will be made to point out the relations and possible significance of such work as has been completed or is in progress. The recent activities may for convenience be considered under the following headings, which, however, are not sharply defined, viz., (1) Research on the principles and theories of electrodeposition; (2) Research upon the deposition of specific metals; (3) Literature reviews and pedagogical activities, and (4) Changes in electroplating practice.

I. PRINCIPLES OF ELECTRODEPOSITION.

Much further research and thought will be required before a theory is developed by which the existing data of electrodeposition can be correlated, and from which new facts can be predicted. Until such a goal is approached, the literature of electrodeposition will contain many apparently contradictory statements, and research will of necessity be largely empirical. The most promising feature of the progress in recent years is that numerous investigators have sought to co-ordinate the results of specific researches and observations, in the effort to develop at least a working hypothesis upon which ultimately a comprehensive theory of electrodeposition can be constructed. Among those who, with their associates, have in recent years contributed to the theory of electrodeposition may be mentioned Aten[3], Hughes[4], Kohlschütter[5] and Blum.[6]

The structure of electrodeposited metals is of paramount importance, because it determines their properties. Most of the papers just mentioned relate directly to the structure. In addition, reference should be made to the recent work upon the relation between the structure of a base metal and that of the deposit made upon it.[7] More extended investigation will be required before the practical significance of such behavior in commercial practice can be determined. It presents a fascinating field for metallographic study. The diffusion of electrodeposited metals into zinc[8] is an instance of an effect of the base metal upon the deposit subsequent to deposition.

Among the researches relating to general principles, may be mentioned the studies on overvoltage[9] by Tainton, Goodwin, Knobel and their associates. Such work is essential to a proper understanding of the significance of electrolytic potentials, especially those observed during the deposition of metals less noble than hydrogen, such as nickel, iron and zinc.

A much discussed property of electroplating baths is the "throwing power" or ability to deposit metal uniformly upon irregularly shaped articles. Heatley[10] has given a mathematical analysis of the current distribution in multiple electrode systems, and has pointed out its possible application to electrodeposition. Haring and Blum[11] have defined this property in simple terms and have devised an apparatus by which the relative throwing powers of different solutions may be readily measured. Incidental to such measurements, interesting data upon the potential relations during electrolysis were obtained.

II. RESEARCHES ON SPECIFIC METALS.

This work may be divided into the studies upon the metals and baths in common use, and upon those which are considered rare or uncommon in this connection. However, no such sharp distinction can be made. Thus, the commercial electrodeposition of iron was, until recent years, unusual. Later work[12] has however shown that it is an entirely practicable process, and may find numerous applications, such as in building up worn parts, and in the electroforming of tubes[13], etc.

The great value of symposia in bringing together existing knowledge and stimulating research and experiment, is illustrated by the collection of papers on silver plating[14] before the Faraday Society in 1921.

In a study of nickel deposition Thompson[15] has shown the significance of the acidity of the solutions, and has described methods for its measurement in terms of the pH system, now almost universally adopted by biological and physical chemists for expressing hydrogen ion concentration. The effects of impurities such as copper, zinc and iron in nickel baths have also been determined.[16] Other studies at the Bureau of Standards have included the conductivity of nickel solutions, and the properties and behavior of nickel anodes.

The paper by C. P. Madsen[17] upon ductile nickel is of special interest in electroforming. The work of Graham[18] upon the nickel plating of zinc suggests new methods for attacking this important problem.

Interest in zinc plating has been greatly increased because of its recognized value for protection against the corrosion of iron and steel. Recent researches[19] have related chiefly to the zinc cyanide plating solutions, principally because of their generally recognized superior

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[1] Published by permission of the Director of the Bureau of Standards. A paper presented at the Forty-fifth General Meeting of the American Electrochemical Society, held in Philadelphia, Pa., April 24, 25 and 26, 1924.

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throwing power. The obvious advantage in cost, simplicity and stability which are possessed by the acidified zinc sulfate baths emphasize the desirability of improving their throwing power. If this can be made to approach that of the cyanide solutions, a great impetus will be given to the use of the sulfate baths.

A few papers have appeared in recent years upon lead[20] and tin[21] plating, although neither process is extensively applied commercially.

One of the less common metals recently employed in electroplating is cadmium. Although no extended researches upon this subject have been published, the process has been applied to a considerable extent upon a commercial scale. Cadmium exerts intrinsic protection to small exposed areas of iron and steel, and is not itself so readily corroded as zinc. The probable field for cadmium plating therefore lies in the protection of iron by a metal which is in many properties intermediate between zinc and nickel. Further observation will be required to determine whether its use as a protective coating under different conditions of exposure is warranted by its increased cost.

The outstanding new subject of research in electrodeposition in the last few years is chromium plating. Owing to the fact that many of the published references to such work are vague or incomplete, it is difficult to summarize the results. So far as can be learned, it appears that the deposition of chromium in a coherent and adherent form is entirely feasible, and that the difficulties which now hinder its commercial application are no more insuperable than those which have been overcome with other metals. The commercial field for chromium plating remains to be defined. Its chief value appears to depend upon the great resistance of chromium to oxidation at elevated temperatures, and to atmospheric and chemical attack, and upon the fact that the chromium deposits are more nearly impervious than are those of most metals. This property is of special importance, if, as now appears probable, the chromium coating will not protect adjacent small exposed areas of the underlying iron. The principal recent publications on this subject are those of Sargent,[22] Liebreich[23] and Schwartz.[24]

The deposition of alloys is of importance, both with respect to their intentional production, when they are desired, and their avoidance when pure deposits are essential. There is no other single branch of electrodeposition in which there are so many important and fascinating problems as in the deposition of alloys. Brass plating is now conducted commercially upon a large scale, and appropriately therefore we find that the most extensive recent work on alloy deposition is devoted to brass plating.[25] Bronze plating[26] has also been studied but is not employed on a commercial scale. The study of the deposition of lead-tin alloys[27] is of interest chiefly in illustrating certain principles and methods of study.

veniently available that which has been learned by research

III. REVIEWS AND PEDAGOGICAL ACTIVITIES.

Even more significant than the researches in recent years are the summaries of the literature of electrodeposition. Especially in the present state of the electroplating industry it may be even more important to render conand experience than to add to our existing store of knowledge. A splendid illustration of such activities is the comprehensive resumê upon iron deposition by W. E. Hughes.[28] The same author[29] has published in simple readable form a series of articles upon the plating of the various metals, and more recently[30] has reviewed critically the work done in electrodeposition in the past two years. Knox[31] has also published a number of papers upon the deposition of the important metals. Haas[32] has summarized the existing knowledge and practice in nickel plating.

The American Electroplaters' Society has in its Monthly Review published numerous articles upon plating practice, which are suggestive and stimulating both to platers and investigators. To this Society should be given a large share of the credit for the increased interest in this field recently developed in the American Electrochemical Society.

IV. PLATING PRACTICE.

Frequently we realize keenly the gap that exists between the acquisition of knowledge and its practical application in an industry. That such a gap still exists in the electroplating field cannot be denied, but fortunately it is being bridged by the co-operation of electroplaters and chemists, of which co-operation there are many encouraging evidences. It is probable that there are today in America ten times as many chemists who are directly interested in electroplating, as there were ten years ago, and, what is even more significant, there are many more platers who have acquired a working knowledge of chemical principles. The result of the co-operation between chemists and electroplaters is indicated by the increasing number of plants in which solutions are operated under analytical control, by the more frequent use of devices for agitation, filtration, circulation and mechanical operation, by the efforts to apply both new and old principles to practical problems, and by the more frequent use of specifications for plating. Such a result has been accomplished only because chemists have recognized that the platers have through long experience gained a large fund of information, and that the two groups working together can accomplish that which neither can do separately. The Electrochemical Society should continue its efforts to foster just such co-operation, through appropriate symposia and round table discussions.

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Taxation: The People's Business

Secretary Mellon has written a book entitltd Taxation: The People's Business, (published by the MacMillan Company, price $1.50) giving facts of the Treasury Department's program and an interpretation of the ideas underlying its policy. He discusses fundamental principles of taxation; treasury policies; revising the taxes; surtaxes; taxing energy and initiative; state taxes; benefits of tax reduction and tax-exempt securities.

Many of the views on taxation expressed in these chapters have appeared from time to time in letters to Committees in Congress, and to various organizations and individuals.

In several appendices are given communications to Hon. Wm. R. Green, Acting Chairman on the Committee of Ways and Means in the House of Representatives, and various tables showing comparative taxes in the old and proposed laws; also the growth of tax-exempt securities and an address by President Coolidge on the subject of taxation.

The Tarnishing and Detarnishing of Silver

Causes of Tarnishing and Comparison of Methods of Removal. Properties of Moss Silver.* Conclusion.

By G. W. VINAL and G. N. SCHRAMM

Discs of silver sulphide, 5 cm. in diameter were prepared and the total amount of silver sulphide which could be reduced at a temperature 50°C. during a period of 3 hours was determined. The results are given in Table 4. All of the cleaners were 21 cm. in diameter and immersed in the same electrolyte.

TABLE 4

REDUCTION OF SILVER SULPHIDE BY THE VARIOUS SILVER CLEANERS

Cleaner	Initial Weight (grams)	Final Weight (grams)	Loss in Weight (grams)	Equivalent Sulphide Reduced (grams)
Device with grid..	5.8806	5.6544	*0.2262	1.747
Aluminum	4.3938	4.3936	0.0002	0.002
Zinc	4.3936	4.3919	0.0017	0.013

*Accompanied by a strong odor of hydrogen sulphide.

Following this the first cleaner was used to complete the reduction of one of the discs weighing about 5.6 grams. The complete reduction was accomplished over night at a temperature of 50°C. The resulting product was a grey-white sponge silver practically free from sulphide. During the process the cleaner became heavily coated with electrochemical products as shown in the photograph of Fig. 18. The amount of sulphide thus reduced, 5.6 grams in a continual operation is equivalent to that of 300 pieces of heavily tarnished flat silverware.

The presence of the tinned grid soldered to the zinc makes a short-circuited primary cell when immersed in the electrolyte. This would normally result in a wastage of the zinc if the cleaner were left unused in the solution. The hydrogen overvoltage on tin is high and is a mitigating factor. The potential relations of the metal minus the electrolyte are about as follows:

Tin	+ 0.14
Zinc	— 0.50
Difference, Tin — Zinc.....	+ 0.64
Hydrogen overvoltage on tin.....	.55
Effective difference.....	0.09 volt.

The effective difference is therefore small and the corrosion correspondingly reduced.

In order to determine the potential relations of an oxidizable metal, as zinc, in combination with two metals which are both more noble than it, reference is made to experiments on an analogous combination which were made previously for another purpose. Two cells, each having copper and zinc electrodes immersed in a normal solution of ammonium chloride were used. The electrodes in the first were designated as Cu_1 and Zn_1, and in the second as Cu_2 and Zn_2. The two cells were connected by a syphon filled with electrolyte. The following relations were then determined by means of a very high resistance voltmeter.

Zn_1 to Cu_1	— 0.86
Zn_1 to Cu_2	— 0.88
Zn_2 to Cu_2	— 0.88
Zn_2 to Cu_1	— 0.88
Average potential difference	— 0.88

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One cell was then short-circuited and the combined electrode measured against the zinc of the other cell with the following result.

Zn_1 / Cu_1	to Cu_2	— 0.84
Zn_2 / Cu_2	to Cu_1	— 0.82
	Average	— 0.83 volt.

The potential difference between the couple and the base metal is therefore practically the same as between the single metals. Applying this to the case of the silver cleaner of zinc with the tinned grid, the potential of the cleaner against silver is the same as the potential of zinc alone against silver. This fact shows the reason that silver is in reality the cathode when present and that the tinned grid serves only to maintain good metallic contact between the zinc and the silver.

Potential measurements were made directly on silver and the various cleaners in the usual solution of salt and soda. These results, Table 5, furnish a confirmation of the relations as stated above.

TABLE 5

SUMMARY OF MEASUREMENTS ON VOLTAGE RELATIONS

(The values are given in volts and represent the steady readings after ten minutes immersion in the electrolyte.)

Specimen	Device with grid	Aluminum	Zinc
With 25,000 ohms in the circuit			
Pure silver.....	.82	.54	.88
Sterling silver.....	.95	.66	.99
Plated silver.....	.95	.56	.82
Means	.91	.59	.90
With 350 ohms in the circuit			
Pure silver.....	.26	.16	.28
Sterling silver.....	.32	.18	.30
Plated silver.....	.24	.12	.26
Means	.27	.15	.28
With 1 ohm in the circuit			
Pure silver.....	.001	.001	.002
Sterling silver.....	.0015	.0015	.002
Plated silver.....	.001	.001	.002
Means	.001	.001	.002

The values with the different resistances are given to show the great effect of polarization. The calculated open circuit voltage would be about 1.4 in solutions containing normal ionic concentrations. Probably the values given for 25,000 ohms represent the open circuit conditions and the values for 1 ohm most nearly approach the practical operation of the devices. The potential difference between aluminum and silver is not as great as between zinc and silver.

(e) Loss in Weight According to Method of Detarnishing.

Test specimens for these experiments were tarnished in an atmosphere of 1 per cent hydrogen sulphide and 5 per cent sulphur dioxide, moist, 15 minutes exposure; color, golden yellow. Each figure given in the table is the loss observed on 30cm² strip and is the mean result calculated from ten cleanings of each of two strips. The results are expressed as the loss in grams per cleaning.

TABLE 6

RELATIVE LOSSES IN DETARNISHING SILVER ELECTROLYTICALLY AND BY AN ABRASIVE

Specimen	Loss observed on 30 cm² test (grams)	Loss estimated for knife (grams)	Loss estimated for fork (grams)	Loss estimated for spoon (grams)
Pure silver:				
Electrolytically	0.00001	0.00003	0.00003	0.00002
By abrasive...	0.0007	0.0022	0.0019	0.0013
Sterling silver:				
Electrolytically	0.00003	0.00010	0.00008	0.00006
By abrasive...	0.0009	0.0028	0.0025	0.0016
Plated silver:				
Electrolytically	0.00003	0.00010	0.00008	0.00006
By abrasive...	0.0012	0.0039	0.0034	0.0022

The loss would naturally be slightly greater in the case of the sterling strips than for the pure silver because it has been shown that the sterling strips become more tarnished than the pure silver when both are exposed to the same tarnishing conditions. The pure silver being softer than the sterling is subject, however, to a greater proportionate loss than the sterling silver when cleaned with the abrasive.

It can not be concluded, however, that the conservation of material by the electrolytic process as compared with the abrasive method of cleaning will always be as markedly superior as these results would indicate. This is because the moss silver left after the electrolytic cleaning will gradually wear off in part at least as the articles are used and if the moss silver is present in sufficient amount to impair the luster of the article the use of an abrasive may be necessary. In any ordinary case it is improbable that the losses of silver resulting from the electrolytic method of cleaning will equal the loss caused by removing an equivalent tarnish with abrasives.

As cyanide solutions are a solvent for silver sulphide and are often employed for detarnishing silver a few experiments were made to determine the loss in weight that occurs when this process is used. Sterling and pure silver strips were tarnished in a solution of sodium sulphide and the gain in weight determined by careful weighings. From this the equivalent amount of silver sulphide was calculated and then the strips were detarnished in a solution of potassium cyanide. In every case the loss in weight caused by the detarnishing process exceeded the amount of silver sulphide calculated as Ag_2S. The results of these experiments are given in Table 7.

TABLE 7

LOSS IN WEIGHT OF SPECIMENS WHEN DETARNISHED BY POTASSIUM CYANIDE

Specimen	Gain when tarnished (mg.)	Equivalent silver sulphide (mg.)	Loss when detarnished (mg.)
Sterling silver.....	0.1	0.8	1.2
Sterling silver.....	0.1	0.8	1.5
Sterling silver.....	0.137	1.05	1.85
Pure silver	0.025	0.19	0.66
Sterling silver.....	0.2	1.55	2.2

The sulphur which causes the tarnish is less than one-tenth of the material removed to eliminate it.

The excess of silver removed over the calculated amount of the sulphide is probably to be attributed to the attack of the cyanide solution of the silver itself. Detarnished specimens were allowed to stand in the cyanide solution for one hour and the following losses were observed.

Sterling silver.....1.5 milligrams
Pure silver .....4.2 milligrams

The loss in weight which occurs during detarnishing is much less by the electrolytic process than for the other two methods.

(f) Electrolytes.

The directions for preparing the electrolytes usually specify the concentrations in teaspoonfuls or tablespoonfuls of the salt and soda per quart of liquid. This involves a large uncertainty, but nothing in these experiments has indicated that the exact proportions are of any considerable consequence. A tablespoonful is equal to 15 cubic centimeters and a teaspoonful is one-third this amount. The weights of the various quantities of salt and soda can therefore be determined experimentally. Since a teaspoonful per quart of water corresponds roughly to 1/10 normal solutions of these substances, many of the experiments were made with tenth normal solutions which could be prepared exactly and reproducibly.

About one hundred specimens of silver and the other metals used in the detarnishing process and for the base metal of plated ware were prepared for corrosion tests in the following electrolytes: N/10 sodium chloride, sodium bicarbonate, sodium carbonate, and combinations of sodium chloride with the carbonate and bicarbonate. The various metals were tried singly and in couples for various periods of time. Table 8 shows the results obtained on single metals immersed in the electrolytes indicated.

TABLE 8

CORROSION OF SINGLE METALS IN ELECTROLYTES

Solutions are as follows: No. 1, N/10 NaCl; No. 2, N/10 $NaHCO_3$; No. 3, N/10 Na_2CO_3; No. 4, N/10 NaCl and N/10 $NaHCO_3$, equal parts; No. 5, N/10 NaCl and N/10 Na_2CO_3, equal parts. Plus sign indicates gain in weight.

Metal	Solution	Time	Loss Weight	Remarks
Sterling silver...	1	11 days	0.1	No visible effect.
" "	2	"	+0.1	Faint tarnish.
" "	3	"	0.0	No visible effect.
" "	4	6 days	0.1	" " "
" "	5	"	0.0	" " "
Nickel silver.....	1	25 mos.	5.7	Specimen discolored, red.
" "	2	"	1.4	Slightly attacked.
" "	3	"	1.7	" "
Nickel	1	11 days	0.6	No visible effect.
"	2	"	0.1	" " "
"	3	"	0.1	" " "
Steel	1	"	68.6	Heavy green stain.
"	2	"	+0.5	Slight rusting.
"	3	"	+1.6	" "
Britannia metal..	1	9 days	1.3	Slightly attacked.
" " ..	2	"	0.0	No visible effect.
" " ..	3	"	0.0	" " "
Brass	1	11 days	+0.4	Mottled, red
"	2	"	+2.5	Blue-black
"	3	"	0.6	Faint stain

Sterling silver was practically unattacked by any of the electrolytes. Nickel silver was also very resistant to the action of the electrolytes during more than two years immersion. Analysis of the solutions in which the nickel silver specimens were immersed showed principally nickel and slight traces of zinc and copper. Nickel was unattacked but steel was badly corroded by the salt solution as would be expected. The carbonates attacked the brass.

The next step was to determine the effects of the electrolytes on various couples. Silver in combination with baser metals representing plated ware with the base metal exposed to attack, and also the action of silver and the metals used for the cleaning process, were tried. The results of these tests are shown in Table 9. The general character of the results can be anticipated from the relative position of the metals in the electrochemical series. For some combinations the bicarbonate solutions are to be preferred, but the differences are small except in the case of silver and steel for which the carbonate is preferable. Nickel silver is particularly resistant.

A third step was then taken to determine whether the use of a single metal for the cleaner is more deleterious to plated ware than the bi-metallic cleaners, as has been claimed. The argument in this case is as follows: The single metal cleaner becomes passive because of the formation of a film on its surface and the silver and the metal on which it is plated can then form a couple which may result in the corrosion of the base metal and damage the plating. It has been claimed for the bi-metallic cleaners, however, that the use of the second metal, providing, as it does, good metallic contact between the silver and the metal of the cleaner protects the plated ware from the formation of effective couples. The experiments recorded in Table 9 may be considered to represent the couples of silver and base metals during the cleaning process, if insulated from the metal of the cleaning device because of the formation of an insulating film or for any other cause. The experiments recorded in Table 10 show what protective action there may be to the plated ware by maintaining a satisfactory metallic contact between the couple and a strip of zinc or aluminum.

TABLE 9

CORROSION OF COUPLES IN ELECTROLYTES

THE ELECTROLYTES ARE DESIGNATED BY NUMBERS AS IN TABLE 8

Couple	Solution	Time	Loss in Weight	Remarks
Nickel silver	1	25 mos.	19.4	Base metal corroded at liquid surface.
Pure silver			0.1	
Nickel silver	2	"	0.4	Effect negligible.
Pure silver			0.1	
Nickel silver	3	"	0.1	Effect negligible.
Pure silver			0.0	
Nickel silver	4	6 days	1.8	Base metal slightly discolored.
Pure silver			0.0	
Nickel silver	5	"	0.0	No visible effect.
Pure silver			0.0	
Britannia metal	4	9 days	8.2	Base metal corroded.
Pure silver			0.0	
Britannia metal	5	"	9.8	Base metal corroded.
Pure silver			0.0	
Steel	4	6 days	86.6	Steel badly corroded.
Pure silver			0.0	
Steel	5	"	42.0	Steel badly corroded.
Pure silver			0.0	
Brass	4	"	+2.7	Brass discolored brown.
Pure silver			0.0	
Brass	5	"	0.2	Brass tarnished.
Pure silver			——	
Nickel	4	"	0.0	No visible change.
Pure silver			0.0	
Nickel	5	"	0.0	No visible change.
Pure silver			0.0	

TABLE 10

CORROSION OF COUPLES IN CONTACT WITH ALUMINUM AND ZINC

Solutions are numbered as for Table 8. The columns giving the loss in weight are marked Al or Zn according to the metal to which the couple was connected. Time immersion 6 days except for the britannia metal, for which it was 9 days.

Couple	Solution	Loss in Weight Al (mg.)	Loss in Weight Zn (mg.)	Remarks
Nickel silver	4	0.1	+0.3	
Pure silver		...	...	
Nickel silver	5	1.7	0.0	
Pure silver		0.0	...	
Britannia metal	4	2.1	28.3	
Pure silver		0.0	0.0	
Britannia metal	5	3.6	33.2	
Pure silver		0.0	0.0	
Steel	4	6.5	1.8	Steel slightly
Pure silver		0.2	0.1	corroded
Steel	5	1.3	3.2	Steel slightly
Pure silver		0.0	0.4	corroded
Brass	4	0.2	3.5	
Pure silver		...	...	
Brass	5	0.1	2.1	
Pure silver		...	...	

Comparing Tables 9 and 10 it will be seen that the results are somewhat irregular, but in most cases the more oxidizable metal afforded some protection to the couple. The silver cleaning process is very short as compared with the time that these specimens were immersed in the electrolyte.

(g) Relative Rates of Detarnishing Silver.

A comparison of the relative rate of detarnishing specimens when using the aluminum disc and the device with the tinned grid was made at temperatures ranging from ordinary room temperatures to nearly the boiling point. All specimens were of the standard tarnish described on page 10. The results are shown in Fig. 19 in which the solid dots are for observations with the former and the circles for the latter. The points for the aluminum scatter so badly that no very certain curve can be drawn through them. Many of these observations fall beyond the limits of the curve and could not be plotted and others were rendered worthless because of uncertain c ntact between the silver and the aluminum. The observations with the other cleaner, on the other hand, were fairly consistent, and

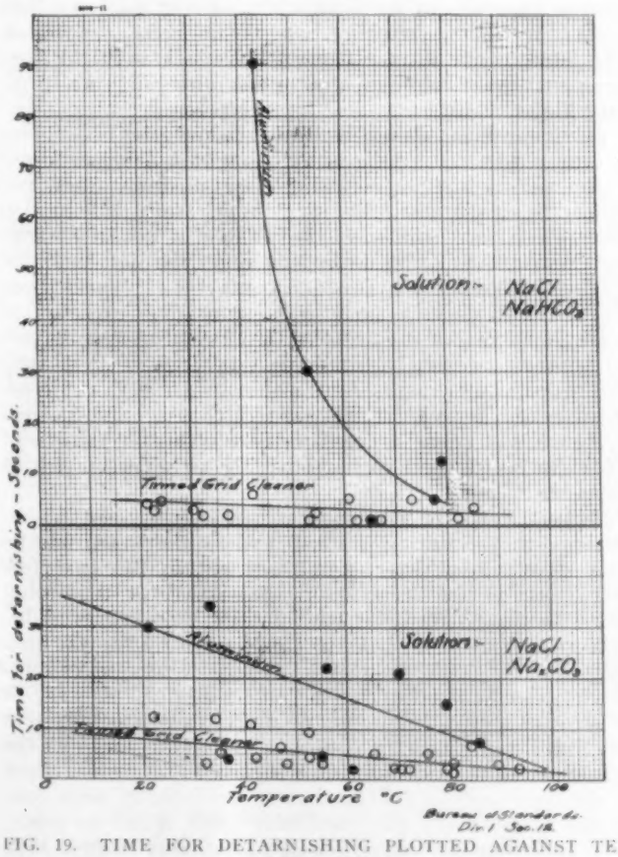

FIG. 19. TIME FOR DETARNISHING PLOTTED AGAINST TEMPERATURE

in only a few cases was the length of time for detarnishing excessive. Fig. 19 shows that the aluminum becomes efficient only at the higher temperatures; the device with the tinned grid is less subject to the effect of temperature. The curves also show that the aluminum worked more satisfactorily with the solution containing the sodium carbonate, but the bicarbonate solution was preferable for the other cleaner.

Nickel in Brass and White Metal

A Lecture Delivered Before the Metropolitan Brass Founders Association, New York, May 14, 1924

By W. M. CORSE

Consulting Metallurgist, The International Nickel Company

The increasing use of nickel in brass and white metal is attracting considerable attention in the brass foundry business. The comparatively recent use of nickel in this way is not surprising, because it was in 1886 that nickel-steel was first described in the technical press. Nickel as a metal is familiar to the general public because of the extensive use of nickel-plated ware, but few realize that only five per cent of the total producton of nickel finds its use in that way.

Nickel forms alloys with twenty-two of the commoner metals. In combination with copper and zinc in brass proportions it acts as a decolorizer and gives us the class of alloys known as nickel-silvers, or, before the war, as German silvers. Its function here is two-fold—to decolorize, and to increase resistance to corrosion. Its principal use is in flat keys and spoons.

Nickel in amounts from 0.05% to 1.5% will increase the density of a structure of any copper bearing composition containing upwards of 80% Cu to a remarkable extent. The density is increased progressively in proportion to the amount of nickel added up to 1.5%. There is no improved effect produced as far as density is concerned over the range just mentioned when the nickel content varies from 1.5% to 5.5%. From 5.5% to 10% the density of the structure is again noticeably improved. The latter range is now almost universally used by concerns that make castings which must withstand extraordinary high pressure.

If the hardness should be kept constant, the tin content is usually lowered as the nickel content is increased.

Articles such as lubricators, injectors, inspirators, impellors, and the like, that are tested from 125 to 350 pounds pressure, will show losses due to porosity ranging from 5% to 15%, depending upon the nature of the castings. Special alloys which contain nickel have been the means of cutting these losses from 25% to 75%.

By increasing the density of a structure, castings are made more serviceable for resisting pressure. The anti-acid properties of castings are also considerably improved, because it is a well established fact that a close-grained structure will resist the erosive and corrosive effects of acids far better than castings having an open or porous structure.

Nickel is rapidly being adopted in making all types of castings that come in contact with superheated steam. This development has taken place within the past few years, and it has been found that mixtures containing nickel from 8% to 10%, with a tin content ranging between 6% and 10%, balance copper, are by far the best mixtures to use for this class of work. This type of mixture is now generally termed "nickel-bronze."

The use of small amounts of nickel in connection with any brass, red metal or bronze mixture, will improve the tensile strength and elongation to a considerable extent. While there are no definite figures available of tests conducted to determine this particular point, it can be truthfully said that the use of nickel in amounts from 0.25% to 0.5% will improve certain types of tin bronze mixtures to the extent of 15% to 30%, in tensile strength. Tests were made with 88-10-2 which, when cast into regulation test bars, had a tensile strength of 38,000 pounds with an elongation of 28%. On remelting 0.35% nickel was added, which raised the tensile strength to 50,000 pounds and the elongation to 55%.

Experience has shown that practically every mixture used in common brass foundry practice can be improved both as to tensile strength and elongation with the addition of nickel in amounts from 0.1% to 6%. The good effects produced are more pronounced as regards toughness.

Ordinarily very little thought is given by the mechanical engineering field to the remarkable improvement effected by the use of small amounts of nickel in connection with copper base compositions. This is due, generally, to the fact that tests for strength and toughness are rarely ever demanded. We know of no agency that will produce the same good results as does nickel in this connection. We do not mean to say, however, that every conceivable mixture, no matter what its composition might be, is greatly improved with the use of small amounts of nickel.

Bearing bronzes of the copper-tin-lead type are noticeably improved by the use of nickel in amounts ranging from 0.25% to 3.5%. This is particularly true in that type known as "heavy duty" bearings such as are used in rolling mill work. The tensile strength and elongation of a mixture like 80-10-10, when modified to contain 1% of nickel, will be improved from 10% to 30% in most instances.

A foundry in Monessen, Pennsylvania, displaced 5% of tin with an alloy of equal parts of copper, tin and nickel, with such good results that unsolicited compliments came from its customers, the rolling mills. In this instance the nickel content was 1.66%.

By the use of an alloy such as described above, containing 33⅓% each of copper, tin and nickel, no bad effects can be detected from the nickel addition. Its melting point is 1680° F., so that no overheating is necessary to get the nickel in solution.

Another important improvement in bearing mixtures containing nickel is that the resistance to compression is increased. This does not mean to imply that the plasticity of a structure is in any way impaired. On the contrary it is improved. We find that nickel is very beneficial in this respect in that the mixture having it will not only bear a heavy load, but will withstand heavy shocks and jars far better than a mixture without nickel. Yet, the structure will be sufficiently plastic to make it readily conform to irregularities in a shaft or journal.

One of the outstanding benefits obtained in connection with the use of nickel in those types of bearing bronzes that contain high amounts of lead, is that the presence of nickel quickens the rate of cooling to such an extent that the prevalent condition known as "lead sweat" or "segregation" is reduced to a minimum, thus improving homogeneity.

The principal thing that must be borne in mind, in connection with the use of nickel in all types of brass, bronze or aluminum mixtures, is its high melting point and refractoriness to heat. We find it is preferable when using nickel in a mixture that it be introduced through the medium of a rich alloy, which melts about 1700° F.

Another instance where nickel is very beneficial is in the field of those compositions known as brazing metal. This particular class of composition invariably contains about 85% copper, remainder zinc and small percentages of tin. About 0.25% nickel added to a mixture of this kind imparts a very beneficial effect when brazing metal to metal of the same composition. A much stronger bond

is produced. Tests along these lines have shown that the strength of the bond is increased from 20% to 30%.

Nickel is now playing a very important part in the aluminum alloy field. The principal advantages in this respect is that nickel densifies the structure, producing a very fine surface which is more capable of taking a high polish and holding the luster for a considerably longer period. All objects made of aluminum where color is important are now being made from compositions containing from 1% to 3% nickel.

Another field are those aluminum alloys that are made into castings and then heat treated. It has been found that small percentages of nickel added to aluminum mixtures containing magnesium and manganese respond very readily to heat treatment and it has a noticeable effect in increasing tensile strength as well as the toughness of such alloys.

Recently, some of the special alloy manufacturers, such as the Alloys and Products Company, of New York City, have spent considerable effort on the development of alloys containing nickel, both as additive agents and as final alloys. The results of this work by them and other similar concerns are bringing out the advantages of nickel in red brass. One of the lubricator manufacturers in Detroit makes a cylindrical casting about 1½" diameter and 3½" long, hollow, with 1/16" walls for 2" of the length, the remaining 1½" of length being solid. The hollow portion is partly closed at one end. They were losing 30% due to leaks where the 1/16" walls joined the heavy section. This was reduced to 15% by the use of a rich alloy of equal parts of copper, tin and nickel, in sufficient quantity to add about 0.5 % of nickel to the metal. They also used a deoxidizer which carried a little nickel, making the total nickel content about 0.6%.

Another lubricator company in the same city makes a very complicated body casting carrying a number of internal cylinders which are drilled to make tubes. These castings have always been a source of trouble on the pressure test bench, the defectives running up to 30% at some times. Good foundry practice reduced this loss to 20%, but it remained for the addition of nickel in amounts of 0.75% to cut this loss in two, reducing it to 10%. Those of us who have had experience in making pressure-tight brass castings will know that this is a distinct achievement and a great money saver. One of the interesting things about this story is that the cost of the metal was not increased by adding nickel, because the lowering of the tin content offset it. The cost of final casting was much reduced and a distinct saving effected by the procedure.

A Chicago concern making flush valves has found that nickel added to brass reduces the loss on the pressure test in about the same way as in the previous instance. Many thousands of dollars can be saved and much delay in deliveries avoided by following such a procedure.

Doubtless many other uses for nickel-bearing alloys will suggest themselves, but the few instances given will illustrate the benefits to be derived in some cases and point the way to others.

As evidence of the increasing use of nickel in brass, the ingot manufacturers find it difficult to obtain raw materials which does not contain nickel. In most cases the nickel content is a benefit so that the condition is not objectionable.

Direct Current Transformer

A Discussion About Low-Voltage Transformers for Direct Current

In THE METAL INDUSTRY for May, 1924, page 205, a shop problem and its answer were published as follows:

TRANSFORMER

Q.—Can a transformer or rectifier of about 2 volts and 20 to 40 amperes capacity be bought for plating? I am experimenting and want to get away from batteries.

A.—You should be able to purchase a transformer to accomplish your purpose. We presume you intend to take your current from an electric light circuit 110 volt D. C. Any good electric supply house should be able to furnish you with such a transformer. There are plenty of transformers for electric bell circuits but the amperage is low —2 to 5 amperes.—C. H. P. Problem 3,235.

A short time after publication, a letter of criticism was received from H. E. Willmore, Jr., assistant manager of the Crown Rheostat & Supply Company, Chicago, which read, in part, as follows:

". . . . the transformer cannot be used on direct current. The bell-ringing transformers do not supply direct current, and can be used only on alternating current circuits."

We investigated further, after thanking Mr. Willmore for his interest in advising us of what he considered to be an error. This investigation resulted in the following communications:

"The correspondent is asking for 20 to 40 amperes and we know of no transformer that is used excepting at a small number of amperes, 2 to 5 amperes. . . . .

"It is our opinion that the inquirer should use a small motor-generator set of 50 ampere capacity driven by a little motor from the regular lighting circuit. If he does not wish to do this, he could use the storage battery.

This statement, of course, corroborated the answer as published.

We received another letter, however, agreeing with Mr. Willmore, which read, in part, as follows:

"Transformers, either of the bell-ringing type or any other type are used only to transform alternating current of one voltage to alternating current of another voltage, either higher or lower than the voltage supplied and cannot be used to produce a direct current either from an alternating or direct current supply."

Finally we received a letter from the Gisholt Machine Company, of Madison, Wis., reading, in part, as follows:

"The Gisholt Machine Company is manufacturing a direct current transformer, not only for the purpose of ringing bells and buzzers for use in connection with signal systems of all kinds. Our maximum capacity is approximately 5 volts at 7 amperes."

A circular of this company states that the transformer was developed and put into practical use some four years ago, and that over two hundred are in use in the Chicago district.

It seems to us clear, therefore, that the point at issue, namely, the question of the existence of a direct current transformer of 2 to 5 ampere capacity, is cleared up. The answer to the problem as published, was correct. There is such a transformer.

Casting Metals

A Variety of Melting and Molding Troubles and Their Solutions*

Written for The Metal Industry by WILLIAM J. REARDON, Foundry Editor

ALUMINUM POURING TEMPERATURES

Q.—We are having trouble in making thin aluminum castings in our foundry, and are using the following mixture: 92% Aluminum and 8% Copper. The flasks are all weighted before pouring, and we are using considerable care in the ramming of these flasks. Notwithstanding this in nearly every casting there are a number of small holes, which we cannot polish out on account of their depth. These holes are not caused by dirt in the molds, and we are at a loss to understand what the trouble is. The castings are aluminum step-plates for automobiles, and if you can give us any information whatever with regard to the mixture of the molding of same that will bring these castings from the sand in a clean condition and without holes, we will be very glad to have it, and will promptly remit the amount of your bill for same.

A.—The small holes in the castings are known as pin holes and are caused by pouring at too high a temperature into the mold. The more rapidly the metal sets in the mold, the better it is for the casting.

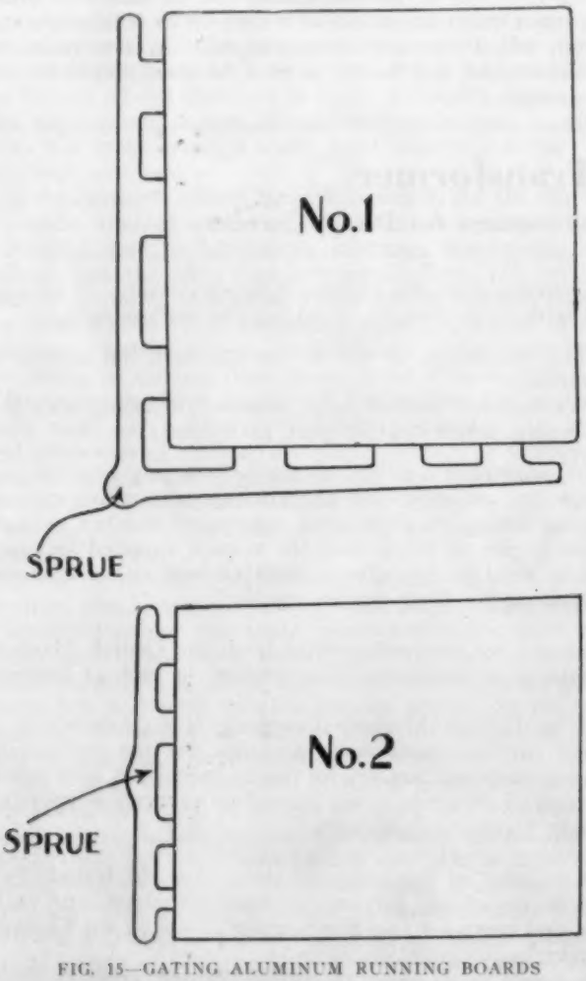

FIG. 15—GATING ALUMINUM RUNNING BOARDS

The remedy in this case is to pour at a temperature that will eliminate the pin holes. This can very easily be determined by making a few castings and pouring at as low a temperature as will run the work. If the pin holes are still there change the gate so the metal will enter faster. We suggest you try a gate like Fig. 15.

If you pour at low enough temperature and your molding sand is as dry as will work nicely, and you do not ram too hard, your pin holes will disappear when made from a mixture of 92% aluminum and 8% copper.

*Previous problems have been published in our issues for January, February, March, April and May, 1924.

Imperfect Leaded Brass Rod

Q.—I am having trouble with rod (leaded) and some flat metal, but more so with the rods castings. A yellow, coarse formation comes into the center of the casting and makes a weak place in the finished rod. This does not show up regularly; some weeks it doesn't appear at all; then a whole day's work will have this, in a big part of the castings. Can you advise me what causes this trouble?

A.—These spots are caused by high heats and keeping the metal in the fire too long after it is ready to pull. The metallurgists term it a "gamma crystal." The alpha and beta crystals form the perfect alloy, or a "solid solution" and result in a copper-zinc alloy that will give the maximum strength of that particular alloy. These yellow spots or "gamma crystals" are the result of an imperfect alloy, an excess of zinc that the copper has not taken up, resulting in a structural weakness. Although it is only a small portion of the casting, when it is reduced in diameter, and elongated, it runs through a long section of the finished rod and makes it unfit for use, as the diameter is still further reduced by turning, in the manufacturing of the finished articles.

These spots were a more common trouble when pit fires were more generally used; it has been reduced to a great extent by the use of the electric furnaces with their better heat control. The fact that they appear at irregular intervals would mean that these were the "off-days" in the casting shop, when the crews for some reason let the heats get away from them.—W. J. PETTIS.

Bending Brass and Copper Pipe

Q.—What is the best method to follow in bending brass and copper pipe and prevent reduction of flow area?

A.—In bending large sizes of pipe fill with dry sand and plug the ends. Heat to a red heat in localities to be bent, and bend. Be sure that the sand is dry. Where bends are slight it is often unnecessary to use sand or resin. The object of sand or resin is simply to keep the sides of the pipe from collapsing or to prevent reduction of flow area. If wet sand is used and the ends are plugged the pipe may burst due to the steam pressure generated.

Resin can be used as follows. Pour it into the pipe and allow it to cool and harden. As soon as the resin is hard, bend the pipe cold. Don't heat it. Then after the pipe is bent, heat the pipe all over sufficiently to melt and remove the resin.

There are many excellent mechanical devices on the market for bending pipe. To bend large, stiff pipe slightly, and inexpensively, there is nothing handier or more efficient, in my judgment, than a hydraulic pipe bender driven by a hand pump.—P. W. BLAIR.

Molding Machine Practice

Range of Application, Difficulties, and Solution of Difficulties. Various Methods of Pattern-Mounting and the Use of Pattern Plates—Part I

Written for The Metal Industry by R. R. CLARKE, Foundryman

Summing up molding machine applicability, the following rules can be stated in a general way:

1. Molding requirements are the main distinguishing factors in selecting a machine for any class of work.
2. Hand ramming machines can be used wherever patterns can be machine drawn.
3. Hand machines are generally less efficient than power machines.
4. The squeezer machine applies mainly to the shallow mold but can be extended to any class of work on which a pressing-in board can be designed to meet the ramming essentials.
5. The jolt machine is primarily a pien ramming machine.
6. The jolt-squeezer machine combines pien and butt-ramming and covers a wide range.
7. The "sand slinger" is mainly a ramming mechanism efficiently applicable to most any class of medium and heavy work.
8. The roll-over machine has a marginal advantage, entering its domain with those molds too heavy to be rapidly and easily rolled by hand, and ending where the weight or size of mold would overtax any reasonable mechanism to swing it bodily through an arc approximating a semi-circle.
9. The roll-over-pattern-draw machine offers the decided advantage of dropping the mold perpendicularly from the pattern, and for this very good reason cannot be held strictly to the preceding limitation.
10. The number of molding operations covered by a machine is not always a measure of its advantages.
11. Any individual operation is an asset only when improving on the hand method.
12. A complicated machine is not a good foundry proposition.

DIFFERENT MAKES OF MACHINES

This articles makes no attempt whatever to discriminate between the different makes of machines or to subject them to public discussion, but it is fair to observe that the standard makes that have survived the test of years are the safer venture. Among these, in connection with my own experience, the following are noted: Tabor, Arcade, Herman, Adams, Davenport, Rapid, Beardsley Piper and Grimes machines.

THE HOME-MADE MACHINE

Different foundries have at times built their own machines to suit their own specific needs. In some instances the venture has been well taken, though as a general rule the policy appears doubtful. Molding machine manufacture is a business in itself, and the manufacturer, who has spent years of study and research in equipping for such work will, by building to individual specifications, stands a far better chance of delivering a more satisfactory article at a lower cost. Surprises usually follow the attempt to build.

CHANGING THE MACHINE TO SUIT INDIVIDUALS NEEDS

The custom-made machine suits the foundry trade in general. Very often a slight and comparatively inexpensive change will accommodate it to some specific requirement, and it will usually be found better to do that, than to put up with a handicap. I remember once making a stripping plate machine out of a machine not so designed by simply planing the thickness of the stripping plate off the machine table and raising the pattern on the pattern plate to the same extent. In our own foundry at the present time we have quite a few hand-ramming pattern-draw machines. We have also a number of Rapids. Now the Rapid is an air-squeezer with no pattern draw attachment and has the air cylinder at the bottom of the machine. On the hand machines a considerable tonnage is at times made that could just as well be squeezed as hand rammed, so we have moved the cylinders on several Rapid machines from the bottom to the top of the machine, placing them in an inverted position, and have set the hand-ramming machines directly under them. Instead of ramming by hand as before we simply squeeze from the top downwards and have realized quite substantially on the change.

THE HAND MACHINE VS. THE POWER MACHINE

The hand machines are of three types, mainly, the hand ramming, the hand jolt and the hand squeezer. Of the three, the hand squeezer is the most widely used. It is simply an involution of man power through the medium of the lever in some form or other, and is intended principally for those foundries not possessing the sources of power necessary for the power machine. As a general rule it cannot naturally compete with the power machine in either tonnage or cost, especially if the casting demand be in any way heavy. The rule, however, is by no means absolute. Power machines consume power while hand machines are exempt from this heavy item of expense. Now, since the cost of a casting is a primary consideration, it logically follows that if a power machine is not given sufficient work to overcome the power expense handicap, then the hand machine is the wise choice if equal to the work in question. Such was the author's experience on the Pacific Coast. We started off with hand machines which made an admirable showing. But the cry was for power machines and they became a losing proposition simply because the demand was not there. It was purely a case of a 50 h.p. motor wasting its energy on a 10 h.p. load. Besides, in different classes of work the hand machine leaps to an advantage regardless of tonnage demand. When adeptly handled, the hand squeezer is among the speediest of machines. In its unhampered element, nothing we believe can surpass it. We have seen active operators throw over the hand-lever and pressing-head, incline their hips downward on the lever for pressure and whip the lever and pressing-head back to clearance in less time than many power machines.

MACHINES FAILURES IN DIFFERENT FOUNDRIES

This is by no means an uncommon experience. More than one foundry has tried machines only to discard them, following their failure to make good. Sometimes selection was at fault, but more often, we believe, methods. From the junk pile of a far-western foundry, the author of this article selected four weather-beaten machines that, in their better days had been tried and discarded. These machines were purchased at scrap-iron value, fixed up and put to work in our own foundry with very creditable results. The difference was strictly one of attitude and method. The one foundry knew practically nothing about machine

molding, nor did they enlist the services of a man who did. Nor did they appreciate that most significant of all machine molding facts, namely, that the machine is only a machine and cannot of itself succeed. Worst still, they assigned molders to operate the machines which was probably the surest way of killing them. All experience will agree that the hand method and machine method are separate and distinct, and that knowledge of the one is no reliable indication of insight into the other. Experience shows further that back of all successful molding machine practice will be found invariably some man or set of men, practical to the limit, desperately in earnest and not to be denied; men with the brains and "guts" to put the thing over. Time and again I have observed this with others and experienced it myself. A foundry could be named that, some fifteen years ago, ventured machines without knowledge of machines and got absolutely nowhere. They eventually employed a patternmaker who understood plate-mounting and a few odds and ends of machine practice; they are today one of the many successful molding machine operating foundries of this broad land.

The question is frequently asked, "What foundries can and what cannot use molding machines to advantage?" i.e., "Where and when will it pay or not pay?" The answer is short and simple. Any foundry of any consequence whatever can profit by machine molding providing they adopt the right machine, the right method and have the right man and spirit back of it. The idea that machine moulding and the mounted plate depend on vast duplication for profit is entirely erroneous. Time and again we have substantially realized on orders for castings as low in number as one hundred and never repeated. I do not hesitate to declare, therefore, that the molding machine and the mounted plate are jobbing shop as well as a manufacturing plant propositions, provided brains and spirit are behind them. And I propose herein to demonstrate that proposition, but must first pause to gather together those necessary premises bound up in the different methods and schemes of mounting patterns on plates.

Part 2 of this article will be published in an early issue.—Ed.

A List of Alloys

Reprinted from the Booklet Published by the American Society for Testing Materials. Part 7*

By WILLIAM CAMPBELL†

ALUMINUM BRONZES, ETC.

	COPPER CU	ALUMINUM AL	IRON FE	ZINC ZN	NICKEL NI	OTHER ELEMENTS
Aluminum Brass	63.	3.33	....	33.66	....	
Aluminum Brass	67–71	1.25–3.5	....	31.75–25.5	....	
Aluminum Bronze, Percy	90.	10.	....	....	....	
Aluminum Bronze, Percy	86–89	12.5–7.5	....	....	....	Mn, 0.5-1.5; Pb, 1-2
Aluminum Silver	57.	3.	....	20.	20.	
Aluminum Iron Bronze H	89.43	6.97	3.41	....	....	
Aluminum Iron Bronze R	85.16	6.6	7.52	....	....	Mn, 0.5
Aluminum Iron Bronze S	85.15	9.43	4.74	....	....	Pb, 0.38; P, 0.09
Aluminum Magnesium Bronze	94.5–89.5	5–10	....	....	....	Mg, 0.5
Aluminum Manganese Bronze	89.12	9.6	....	....	....	Mn, 1.2
Aluminum Nickel Bronze	85.	5–10	....	....	10–5	
Aluminum Tin Bronze	85.5	2.5	....	2.	....	Sn, 10.
Aluminum Titanium Bronze	90–89	9–10	1.0	....	....	Ti, trace
Ampco	Bal.	7–11	1–3	....	....	
Cowles Aluminum Bronze	88.4	9.74	0.43	....	....	Si, 1.36
Cowles "A," Special A	89.	11.	....	....	....	
Cowles A 1, 2, 3	80.	10.	....	....	....	
Cowles B	92.5	7.5	....	....	....	
Cowles C 1	94.5	5.5	....	....	....	
Cowles C 2, 3	95.	5.	....	....	....	
Cowles D	97.5	2.5	....	....	....	
Cowles E	98.75	1.25	....	....	....	
Cuproг	94.2	5.8	....	....	....	
Dirigold	(See Oranium Bronze)					
French (Fe Ni Mn)	81.5	7.	4.	....	5.5	Mn, 2.
Emperor Brass	60.	20.	....	20.	....	
Heusler's Alloy	66.5	11.1	....	....	....	Mn, 22.4
Heusler's Alloy	68.	10.	....	....	....	Mn, 18.; Pb, 4.
Heusler's Alloy, Max	61.	13.	....	....	....	Mn, 26.
Hercules Metal	85.5	2.5	....	2.	....	
Hercules Metal	54.	2.5	7.5	36.	....	
Immadium Bronze	(Manganese Bronze with Aluminum)					
Metaline	30.	25.	10.	....	....	Co, 35.
Navy	85–87	7–9	2.5–4.5	....	....	
Oranium Bronze S	97.	3.	....	....	....	
Oranium Bronze M	95.	5.	....	....	....	
Oranium Bronze MH	91.5	8.5	....	....	....	
Oranium Bronze H	90.	10.	....	....	....	

* This booklet can be obtained from THE METAL INDUSTRY for $1. Parts 1, 2, 3, 4, 5 and 6 appeared in our issues of March, April, May, July, September and December, 1923.

† Professor of Metallurgy, School of Mines, Columbia University, New York.

	COPPER CU	ALUMINUM AL	IRON FE	ZINC ZN	NICKEL NI	
Oranium Bronze HX	89.	11.	....	....	....	
Oranium Bronze HH	88.5	11.5	....	....	....	
Rakel's Metal	87.5	10.5	....	1.	....	Mn, 1.
Roberts-Austen (Purple Gold)	....	21.5	....	....	....	Au, 78.5
Reichs Bronze	85.15	0.6	7.5	....	....	Mn, 0.5
Secretan	91–95	9–5	....	....	....	Mg, 1.5; P, 0.5
Superbronze	56.8	1.2	1.3	37.5	....	Mn, 3.2
Superbronze	68.9	5.1	2.0	20.9	....	Mn, 3.0
Tensilite	64.	3.1	1.2	29.	....	Mn, 2.5; Sn, 0.2
Tensilite	67.	4.4	....	24.	....	Mn, 3.8
Tetmajer	86.1	10.	0.98	....	....	Si, 2.48
Tetmajer	89.7	7.1	0.72	....	....	Si, 2.72
Tetmajer	93.3	4.6	0.89	....	....	Si, 0.98
Typewriter Metal	57.	3.	....	20.	20.	

COPPER-MANGANESE ALLOYS

	COPPER CU	MANGANESE MN	IRON FE	ZINC ZN	TIN SN	NICKEL NI	OTHER ELEMENTS
Cupro-Manganese	90.	10.	0.	....	....	....	
Crotorite	70.	30.	2.	....	....	....	
Resistance, Lunge	86.5	11.7	1.8	....	....	....	
Resistance, Lunge	84.32	13.45	1.9	....	....	....	
Resistance Metal	85.	12.	3.	....	....	....	
Manganese Copper	29.2	51.65	9.68	....	....	....	Al, 6.25
Manganese Copper	56.3	40.9	1.5	....	....	....	Si, 1.1
Manganese Copper	75.	25.	....	....	....	....	
Manganese Copper	75.3	22.4	2.15	....	....	....	
Manganese Copper	85.	10.92	1.83	2.0	....	....	C, 0.26
Manganese Copper	85.55	10.66	2.66	....	0.39	....	Pb, 0.45
Manganese Copper	84.33	10.61	2.31	2.1	0.4	....	Pb, 0.3
Manganese Copper	89.7	8.72	1.54	....	....	....	
Manganese Brass	54.2	4.4	2.4	38.2	....	0.5	
Manganese Brass	55.	4.3	0.7	39.5	....	....	Al, 0.5
Manganese Brass	51.15	4.15	2.25	40.	....	2.2	Al, 0.25
Manganese Brass	53.51	3.24	1.44	38.28	1.22	2.14	
Manganese Brass	55.4	3.2	1.06	39.9	....	....	Al, 0.2
Manganese Brass	60.15	2.34	1.19	34.9	0.94	....	Al, 0.23; Pb, 0.39
Manganese Brass	53.4	1.7	0.	39.	2.66	2.5	Al, 0.2
Manganese Brass	53.5	1.53	2.78	39.	....	2.53	
Manganese Brass	69.5	1.0	....	29.5	....	....	
High Manganese Brass:							
Ponsard's	50.	24.	16.	10.	....	....	
Ponsard's	60.	25.	....	15.	....	....	
Ponsard's	75.	20.	....	2.	....	....	
Cowles	67.5	18.	....	13.	....	....	Al, 1.; Si, 0.5
Cowles	75.5	16.5	....	8.	....	....	
Cowles	80.	15.	....	5.	....	....	
Rheotan	84.	12.	....	4.	....	....	
Manganese Bronze	82.4	0.6	....	....	17.	....	
Manganese Bronze	85.75	0.25	....	....	14.	....	
Manganese Bronze	86.3	2.7	....	5.	6.	....	
Manganese Nickel Silver	72.5	2.43	....	8.75	....	16.57	
Manganese Nickel Silver	65.	20.	....	5.	....	10.	
Manganese Nickel Silver	60.	20.	....	....	10.	10.	
Manganin	86–84	12.	....	....	....	2–4	
Manganin	84.	4.	....	....	....	12.	
Manganese Nickel	78.3	14.1	....	....	....	7.6	
Manganese Nickel	82.12	15.02	0.6	....	....	2.3	
Manganese Nickel	73.	24.	....	....	....	3.	
Manganese Nickel	70.	25.	....	....	....	5.	
Manganese Nickel	65.	30.	....	....	....	5.	
Manganese Nickel	51.5	31.3	....	....	....	16.2	
Silvel	73.3	12.	1.8	12.1	....	....	Al, 0.25; Pb, 0.51
Silvel	67.9	6.8	2.22	15.8	....	6.5	Al, 0.13; Pb, 0.48
Heusler's Magnetic Alloys	70.	30.	....	....	....	....	Al, 8–14.5
Heusler's Magnetic Alloy, max	61.	26.	....	....	....	....	Al, 13.
Heusler's Magnetic Alloy	66.5	22.4	....	....	....	....	Al, 11.1
Heusler's Magnetic Alloy	68.	18.	....	....	....	....	Al, 10.; Pb, 4.
Tubes	96.	4.	....	....	....	....	

This list will be continued in an early issue.—Ed.

The Non-Ferrous Exhibits of the British Empire Exhibition

The British Empire Exhibition at Wembley, six miles from the centre of London, is claimed by its promoters to be the greatest exhibition ever displayed. Every part of the British Empire is represented, the goods on view coming from five continents, the various constituents of which speak no fewer than 100 languages. Neither labor nor expense has been spared in the building up of the show, which is to remain open 150 days—until October, 1924.

From the industrial point of view, the display is housed chiefly in a small section of the Palace of Engineering and though the space occupied is comparatively small, the exhibits are of a very complete character. The principal stand is described as the "Non-Ferrous Metal Trades Joint Exhibit" and the arrangements have been carefully handled by a special committee acting for seven associations, as follow: (1) Brass & Copper Tube Association, (2) Brass Wire Association, (3) Brass and Phosphor Bronze Fine Wire Association, (4) Brazed Brass Tube Association, (5) Cold Rolled Brass & Copper Association, (6) Manufactured Copper Association and (7) Nickel Silver Association. Stand 237, displaying these goods, is of ample proportions, and the products shown have been manufactured by 80 firms, chiefly at Birmingham, but representing also Sheffield, Manchester and London. No fewer than 200 firms have contributed in one way or another, either in the preparation of the metal or in actual manufacture, to the exhibit.

The staging of the exhibit is highly effective, the various details illustrating almost all the uses to which copper and the kindred products of brass, bronze, etc., can be applied. Special prominence has been given to the artistic uses made possible by the electric lighting industry, which is largely located in Birmingham. Among the larger exhibits are various constituents for boiler equipment; a deep throat locomotive plate weighing 1,650 lbs. is shown, with the necessary tubes attached. There are good specimens also of condenser plates, and pans of huge dimensions used in connection with the sugar and oil industries. One of such pans weighed 1,650 lbs. and is half an inch in thickness. An effective exhibit is a series of copper rollers of the kind used in the printing industry. The largest types of brewing vessels are merely hinted at, and could hardly be accommodated, as they are sometimes made 18 ft. in diameter and of a weight approaching 5 tons. Copper geysers are shown in good variety, and in the way of ornamental work there are some very pretty examples in copper.

The motor trade makes increasing demands in the non-ferrous industry illustrated by a variety of lamps. In the tube section a good specimen is a copper tube 2 ft. in diameter, 18 ft. long and ⅛-inch thick. Nickel is increasingly used and is shown in a variety of forms occupying a special stand by itself, and illustrating its wide utility for domestic purposes.

Among the small products are ornamental door furniture, locks and finger plates of the kind supplied in large quantities for ships, hotel furniture and similar uses. Some miles of wire are shown attached to coils representing various thicknesses from ⅛-inch down to a texture comparable to fine silk. A curious little exhibit is a range of Indian cooking vessels of primitive design and native workmanship for which the materials were supplied by one or other of the various Birmingham firms.

Messrs. Allen Everitt & Company and Henry Wiggin & Company are leading Birmingham firms who have installed exhibits of their own of a very complete kind. The former firm specializes on tubes, not only round but square, and good examples of the latter are shown. Copper tubes are exhibited ranging in size from ¼ inch to 12 inches with fine specimens of the locomotive boiler tubes produced in thousands for the various British and foreign railways. An interesting leaflet calls attention to the fact that the AE tube was supplied by the firm to such famous vessels as the Aquitania, the Berengaria and the famous warship, the Hood. By way of novelty the office attached to the stand was built entirely of tubes, with a door of sheath copper.

The stand of Henry Wiggin & Company, Ltd., situated close by, is devoted very largely to nickel, the material for anodes, electrical resistance wire, and for various purposes in which stainless qualities are important. A recent speciality is Tarnil, largely used as the basis for spoon manufacture.

The utility of nickel for coinage is illustrated by a range of coins as supplied to various foreign countries. The metal is preferred not only because of its value, but also because of its superior resistance to wear and tear, as compared with silver, and its use for coinage is largely extending. Henry Wiggin & Company also give prominence to specimens of their Corronil alloy, which is a high grade nickel copper alloy containing a small percentage of manganese. Its peculiar quality gives it special utility for various engineering requirements, and this use is extending. The readiness with which nickel will alloy with a wide range of metals is illustrated by numerous samples.

Due prominence is given to such specialities as flexible tubing, exhibited by the Flexible Tubing Company, Ltd., of Powders End, Middlesex. Its remarkable strength renders it extremely useful for a variety of engineering purposes. A tube which will stand a pressure of 250 lbs. to the inch and yet can be turned in almost any direction naturally finds increasing popularity.—G.

Pictures by Telegraph

A sensation was recently created by the fact that pictures were transmitted by wire by the Western Electric Company with a considerable degree of success. It seems that the method is based on the use of a photo-electric cell which translates variations of a beam of light into variations of electric current which can again be translated back into a variation of light.

A small spot of light from a lamp is passed through a lens and directed upon the photographic film to be transmitted. This film, in the form of a cylinder, revolves, and the spot of light passing through it falls upon a potassium pencil which runs through the center of the cylinder. From the surface of this potassium pencil the electrons are thrown off, causing an electrical current. As the light varies due to the fact that it is passing through dark and light places on the film with the picture on it, the current induced by the electrons thrown off the surface of the potassium pencil also varies.

At the other end of the wire, the current is translated back into a light by reversing the process in a receiving instrument and registering on a sensitized film forming a fresh picture.

The potassium which is used in the photo-cell is technically a metal but very little known in its pure form. It is a constituent of caustic potash and has been produced in various degrees of purity for laboratory purpose. The only other metal used to a great extent is, of course, copper for transmission wires.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

Member of Audit Bureau of Circulations and The Associated Business Papers, Inc.

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Contents

EDITORIAL

THE ELECTRO-PLATERS' CONVENTION

The Twelfth Annual Convention of the American Electro-Platers' Society, to be held in Milwaukee, June 30-July 3, inclusive, advance information of which is given in the leading article in this issue, should bring up for discussion a number of important problems. In our May issue Charles H. Proctor, our Plating-Chemical Editor, made a number of recommendations for subjects to be taken up by the Society. Some of these recommendations involve very radical steps which will take long and serious thought before putting into effect, but there is no question about the advisability and even the necessity of considering them.

It seems to us that from a commercial standpoint at least, one of the most important considerations is that of co-operation with the various agencies for distributing plated products to the public, in order to standardize the weight of the electro-deposit on the articles. Silver plate is now, at least in a general way, valued according to the weight of the coating. There is no reason why nickel should not be similarly appraised, and for that matter copper, zinc, tin, etc.

The formation of an Institute of Electro-plating controlled by the American Electro-Platers' Society is an idea full of possibilities but also full of dangers. Without attempting in the least to discourage forward-looking leaders of the Society, we must repeat what we have stated previously in these columns, that this is a step which should be taken only after long and serious consideration and with adequate methods of financing.

The problems of protection against corrosion by means of satisfactory electro-deposits is ever present and the various ways and means which have been devised but not yet perfected should be considered and investigated. Among those mentioned by Mr. Proctor are copper-cadmium alloys; zinc-cadmium; tin-cadmium; chromium; also possibly nickel alloys. Spotting out is another vexing problem which has not yet been solved. The influence of gases in solution, such as hydrogen, oxygen or carbonic acid, and their effects in pitting open another broad field.

There is plenty of work for all to do. The American Electro-Platers' Society has found out what a useful body it can be and how many things in the art of electro-plating require its attention. As manufacturers co-operate with the Society and with the Bureau of Standards there is no reason why the combined efforts of these agencies cannot solve the really pressing troubles or better them in short order.

SHOP PROBLEMS AND ANSWERS

On page 235 of this issue we publish a brief abstract of a discussion about low voltage transformers for direct current. It seems that the difference of opinion lay entirely on the possibility of procuring a low-voltage transformer for direct current work. A communication from the Gisholt Machine Company cleared this up, however, since this company stated explicitly that it manufactured such a transformer.

The point at issue, however, is not the result of this particular discussion. We are more pleased to have received a criticism from one of our readers than to have come out "right" in an argument. We want answers and we want our material to be read carefully and even critically by our readers. If there is any question about the replies we want to know about it so that the matter may be cleared up to the satisfacion of all concerned. Our object is to lay bare the truth.

It may be interesting for our readers to know that in the Plating-Chemical department we receive an average of 40 to 50 inquiries per month. Of course, only a small proportion of these can be published, the rest being answered direct by mail. It is necessarily impossible for anyone to answer 500 or 600 questions a year without eliciting some disagreement. We can only say that the proportion of praise to criticism is easily one hundred to one. We repeat, however, that we consider letters of criticism just as valuable as the letters of praise.

METAL CONSUMPTION

The publication of the 1923 Year Book of the American Bureau of Metal Statistics brings to our attention some interesting conditions in the metal trades, particularly as regards the consumption of metals. It seems that electrical manufactures take by far the largest proportion of all the copper turned out. This is, of course, not a new statement, but nevertheless one which it is well to have verified by reliable statistics. These electrical industries, which include miscellaneous small parts, telephone and telegraph, light and power lines and trolley wire, consumed in 1923 almost 700,000,000 pounds of copper out of a total production of approximately 1,466,000,000 pounds. Other important consuming industries were wire and rod outside of the electrical industries, 99,000,000 pounds; automobiles, 200,500,000 pounds; buildings, 76,000,000 pounds; locomotives and railway cars, 33,000,000 pounds; bearings and bushings, 82,400,000 pounds; valves and pipe fittings, 40,000,000 pounds. The item of exports totals 104,000,000 pounds in the form of manufactures including all primary manufactures of copper and its alloys.

As regards zinc consumption, the industries according to the Bureau are divided roughly as follows: zincing or galvanizing, 467,600,000 pounds; brass making, 350,000,000 pounds; sheet zinc for various purposes, 111,600,000 pounds; miscellaneous, 98,000,000 pounds; making a total of 1,027,200,000 pounds.

From these figures it is probable that about 525,000,000 pounds of new copper go into rolled brass. Cast brass is made to such a great extent of secondary copper that it is impossible to estimate accurately, the quantity of new metal it consumes.

The collection of such statistics is of great value in pointing out to producers the fields in which they are weak and might increase their output. Difficult as it is to get accurate figures there is no doubt that as the work goes on they will be obtained in better and better condition from year to year, and that the labor involved and expense in so doing will be more than repaid in the value of the information gained.

SECONDARY SMELTING MERGER

The combination of smelting and refining companies in the secondary metal field noted on pages 256, 257 and 260 of this issue, has great significance to the entire industry of metals.

It will be noted that the firms included in this merger are among the largest of their kind in the United States. Perhaps a few large organizations remain outside of the Federated Metals Corporation, but the most important factor in the secondary industry is likely to be the new corporation. The Great Western Smelting and Refining Company has long been one of the leaders, and the organization of B. Lissberger & Company with its subsidiaries works has also been a powerful factor.

The progress of this business is indicative of the general trend of American industry. Starting from humble beginnings, junk-collecting and small iron pots for remelting, it has developed into an enormous field involving copper to the extent of $39,000,000; brass $58,000,000; lead, $17,500,000; zinc, $9,000,000; tin, $12,440,000; aluminum, $6,000,000; nickel, $970,000 and with other miscellaneous metals a total of almost $144,000,000 in 1922. Obviously an industry of such scope was certain to develop and to assume the proportions which it has succeeded in doing.

The future of this industry is undoubtedly stable and assured, and it seems likely that the existence of large, solid, reputable organizations will affect it beneficially in many ways. It is a well-known fact that in this industry at least, the existence of large companies does not prevent the entrance and existence of small newcomers. The scrap metal business can be engaged in with a very small amount of capital. It is perhaps for this reason that trade practices in this industry have in the past not been all that they might, but it seems more than likely that with activity of steady, well-balanced factors their customs, which have been steadily improving (due perhaps in a great measure to the efforts of the Waste Material Dealers Association), will become even stronger, and in this way be of assistance to the small manufacturer.

In a word, an industry which was once in the hands of peddlers has now assumed dignity and proportions suitable to its importance.

ELECTRIC BRASS FURNACES

The progress of electric furnace melting in the metal industries has been steady since its inception. According to a report, published on page 244 of this issue, by Gillett and Mack of the Bureau of Mines, there are now 540 active furnaces in the United States using over 60,000 kw. Of these about 275 are induction furnaces using about 16,000 kw., about 135, moving indirect arc furnaces with about 28,000 kw., and 80 are resistance furnaces using about 7,500 kw The remaining 50 furnaces of various types account for the other 8,500 kw. This shows that the situation in the brass industries has been solidifying along the lines developed three or four years ago. There have been no startling upsets, and the growth has been in the direction previously taken rather than in new ones.

The Ajax-Wyatt induction furnace has continued to increase its installations in 24-hour operation in rolling mills on yellow brass, and the use of the Detroit Rocking indirect arc furnace has increased in the foundry and in work of melting metals outside of yellow brass. A new induction furnace by the General Electric Company has 12 or 15 installations. A new resistance furnace is in use, designed by T. F. Baily.

An interesting installation is that of the Ford Motor Company in Detroit which operates twelve one-ton Detroit furnaces and is trying out two General Electric induction furnaces, totaling 3,750 kw., the largest amount of power used for electric brass melting by any other single plant in the world.

An interesting comparison will be noted from the fact that foreign brass melters have not taken up electric melting to any extent compared to American use. The investigators state that it is doubtful whether all the foreign countries together use 100 electric brass furnaces; 35 of these are of American make.

THEORY AND PRACTICE

In one of the discussions of the recent meeting of the American Electrochemical Society in Philadelphia, the age-old argument arose, about the relative importance of theory and practice. No matter how many times this question is discussed, no matter how many times it is settled, it will still continue to rise up, year after year, as a primary difference of opinion.

It seemed to us that F. T. Taylor's opinion was in the right direction when he rejected the old slogan "It is all right in theory but it doesn't work out in practice." Obviously, this statement is a fallacy, but in order to make this clear, it should perhaps be explained.

If a theory is correct, and if this theory is properly put into practice under conditions which conform with the theory, it is impossible for the practice to do anything but succeed. It is only when the theory is either incorrect or not sufficiently complete that practice, following the orders of that theory, fails. Strictly speaking no theory which is correct can fail in practice. If it is properly applied and fails, the theory is proved wrong.

In keeping theory and practice working together at an even pace it is the business of the theorist, the technical and the practical man to co-operate with the business man. Industry depends upon their friendly combination of effort. It matters not a particle which of these four happens to be the discoverer of a certain phenomenon; it makes no difference who actually plays the greatest part in making possible the general application of new discoveries. They are all indispensable; the business man to finance and manage; the scientist to explain existing phenomena, and to pave the way for the discoverer of new ones by the formulation or discovery of basic principles, thus opening new avenues of thought and investigation; the technologist (engineer or chemist), to apply these principles, laid bare by the scientist, to industry, and to plan for the development and use of natural resources and formerly wasted by-products; the practical man to operate plants and to build the structures laid down by the technologist on paper. These are not necessarily cut and dried divisions. In a majority of cases they over-lap to a considerable extent. That, however, is also of minor importance. The real point at issue is that they are all necessary and we should once and for all realize it. There should be no contempt for the work that the other man is doing, fewer discussions and questions about the value of research or the relationship between theory and practice, and more co-operation between those engaged in the specialized branches.

New Books

Metal Statistics for 1924. Published by the American Metal Market. Size 4 x 6, 528 pages. Price payable in advance $1.00. For sale by THE METAL INDUSTRY.

This is the seventh annual edition of a well known book which needs no introduction. It contains the same beneral assortment of statistical information concerning ferrous and non-ferrous metals that has been supplied in previous years with various new tables. It is particularly useful to buyers and sellers of metals and iron and steel products.

Popular Research Narratives—Tales of Discovery, Invention and Research Collected by Engineering Foundation, 29 W. 39th Street, New York. Published by Williams and Wilkins Company. Price, payable in advance, $1. For sale by THE METAL INDUSTRY.

This collection consists of 50 five-minute stories of research and discovery directly from the men who did it.

This collection has been published previously and sent out by the Engineering Foundation in the form of leaflets which formed individual chapters in the book. Many branches of engineering science are covered, and the little book makes attractive and interesting reading.

Year Book of the American Bureau of Metal Statistics,) published by the American Bureau, 115 Broadway, New York.

This year book, now in its fourth annual issue, was compiled by W. R. Ingalls, director of the Bureau and includes, as usual, a set of comprehensive figures on the production and consumption of non-ferrous metals. The production figures are quite complete, and the consumption figures, although far from the completeness and accuracy of the production figures, have improved considerably. A case in point is the table estimated consumption of copper in the United States on page 33.

Technical Papers

Determination of Iridium in Platinum Alloys by the Method of Fusion with Lead. By RALEIGH GILCHRIST, Associate Chemist, Bureau of Standards, Washington, D. C.

This is scientific paper No. 483 of the Bureau of Standards, Washington, D. C., and is No. 4 of a series of investigations on the platinum metals.

A study has been made of the analytical details of the Deville and Stas method for the determination of iridium in platinum alloys containing from 0.1 to 20 per cent of iridium. Specially prepared alloys made from highly purified metals were used in the investigation. It was found that the concentration of nitric acid, the concentration of aqua regia, the proportion of lead, and the time and the temperature of the lead fusion can be varied over a wide range without affecting the determination. The observations of Deville and Stas that palladium and rhodium have no effect upon the determination and that ruthenium separates quantitatively with the iridium were confirmed. In addition, gold was found not to interfere. Iron separates nearly quantitatively with the iridium as observed by Deville and Stas. A method for the separation of iron from the iridium was tested and found to give satisfactory results. The loss in weight of crystalline iridium during the ignition periods is insignificant and the weight of crystalline iridium is not affected by heating and cooling in an atmosphere of hydrogen. Spectrographic examination of samples of iridium from analysis showed that neither platinum nor lead was present in sufficient quantities to affect the determination. The iridium results tend to be low by a variable but usually small amount. One factor in this error is a slight solution of iridium by aqua regia. . A modified procedure for the method is offered, which combines the optimum conditions for speed and accuracy in the various details of manipulation.

Present Tendencies in Electric-Brass Furnace Practice. By H. W. GILLETT and E. L. MACK, Chief Alloy Chemist and Assistant Alloy Chemist respectively, Bureau of Mines, Department of the Interior, Ithaca Field Office, Ithaca, New York.

This report describes the trend of developments in electric brass-furnace practice in the last two years, and supplements Bureau of Mines Bulletin 202, "Electric Brass-Furnace Practice," which was published in 1922. In that bulletin it was pointed out that some of the lines on which electric brass-furnace progress would take place were clear, but others were less so.

The present electric brass-furnace situation may then be summed up as follows: Two types, the induction and the rocking, indirect-arc, typified by the Ajax and Detroit, have found increasing favor in the last two years, while the other types have not made appreciable advances.

There are about 540 active electric furnaces doing commercial non-ferrous melting in the United States, using something over 60,000 kw. Of these about 275 are induction furnaces with about 16,000 kw., about 135 moving indirect arc furnaces with about 28,000 kw. and 80 are old-type Baily furnaces with about 7,500 kw. The remaining 50 furnaces of various types account for the other 8.500 kw.

The popularity of the two chief types has been attained because both are efficient, both give lower metal losses than fuel-fired furnaces do, and both stir the metal.

The induction type is more or less standard for 24-hr. operation in the rolling mill on yellow brass and the rocking, arc type is more or less standard for red brass and for general foundry work. Unless the problem of a satisfactory lining for the induction furnace on red brass is solved, the field will probably continue to be divided in that fashion.

The last two years have produced no startling new developments in this field. Some patents (17) that might be of interest in this field are given at the end of the bibliography. The possibilities and limitations of the electric brass furnace are becoming better understood. The increase in the number of furnaces installed indicates that the growth is likely to continue, and that the electric furnace is of decided use to the non-ferrous metal industry.

Industrial Applications of Metals at Various Temperatures.* By L. W. SPRING, Chief Chemist and Metallurgist, Crane Company, Chicago, Ill.

This is a summary of the development and use of metals at various temperatures and gives outlines of present day practice in that respect.

Available Data on the Properties of Non-Ferrous Metals and Alloys at Various Temperatures.* By C. UPTHEGROVE and A. E. WHITE, University of Michigan, Ann Arbor, Mich.

The purpose of this paper is, not to present all of the work which has been done on the physical properties of non-ferrous metals at elevated temperatures, but to present as far as possible typical properties for the various metals which have been investigated. In many cases alloys have been investigated by only one individual, or investigators have used materials so widely different in composition as to represent in reality two entirely different alloys. In view of this condition and the limited development of the art of the testing of non-ferrous alloys at elevated temperatures, it has seemed unwise to include values from any other than the original sources. In one case, where the original author has drawn his curves to emphasize certain inflections or critical points the values have been replotted and the curves drawn as average curves.

Metals covered are copper; copper-tin bronzes; phosphor bronze; gun metal; manganese bronze; aluminum bronze; brasses; Delta metal; copper-nickel alloys; copper-tin-zinc-lead alloys (steam bronze type); nickel and nickel chrome; Monel metal; Davis Metal; aluminum and aluminum alloys; bearing metals; hardness of alloys; torsion tests.

*A part of a Symposium on Effect of Temperature upon the Properties of Metals, held at a Joint Meeting of the American Society of Mechanical Engineers and American Society for Testing Materials, in Cleveland, Ohio, May 29, 1924.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ALLOY FOR FOOD CONTAINER

Q.—I would appreciate your advising me as to whether you know of an aluminum alloy which will withstand corrosin and discoloring; in particular, which will not be effected by vegetables and other foods.

I am contemplating manufacturing culinary vessels of cast aluminum and test made so far have proven that these cast aluminum dishes discolor after some little use.

A.—All aluminum alloys are attacked by dilute acids somewhat. The best mixture I know to withstand such attacks is composed of:

96%	pure aluminum
2	Copper
2	Magnesium

This alloy keeps the polish better than any other aluminum alloy and is not discolored so easily. The question of corrosion of aluminum alloys is one not settled definitely so far.—W. J. R. Problem 3,237.

CYANIDE DIP

Q.—I would like to know if you could give me any information on removing corrosion from fine brass wire mesh or screen without running through a bright dip.

A.—If you wish to avoid the use of acids in the removal of the corrosion from fine brass wire screen, we would suggest a hot sodium cyanide solution.

Water	1 gallon
Sodium Cyanide	96-98%

2 ozs. or as much more as may be required to rapidly dissolve the corrosion or oxide. Temperature 140° F.

As soon as the corrosion is removed, wash thoroughly in cold water, then immerse in boiling hot water in which has been dissolved 1 to 2 ozs. of soap chips per gallon.

Borax soap chips give the best results.

The thin film of soap acts as a lacquer and will prevent further corrosion if the wire mesh is thoroughly dried.—C. H. P. Problem 3,238.

ELECTROPLATING NICKEL SILVER

Q.—What we wish to obtain is a heavy deposit of 18 per cent nickel silver on copper. We would like the deposit to be approximately 1/32 inch thick, and this to be deposited on a copper rod approximately ½ inch diameter x 3 inches long.

Our reason for desiring the deposit is to prevent oxidation of the copper as it is subjected to a constant heat of approximately 500°.F., while at the same time, solid nickel silver would not have sufficient thermo-conductivity to entirely replace the copper.

If such a plating process is possible, would you be so kind as to let us know the method of procedure, also the plating solution, and anodes necessary.

A.—Nickel silver is very seldom deposited as the difficulty lies in the nature of the alloy. It cannot be deposited from an acid solution, such as either of the three metals that constituted the alloy can.

A cyanide solution should give a satisfactory deposit.

We suggest the following procedure. Dissolve nickel silver in diluted nitric acid, preferably in thin strips of the metal about 2 ozs. of the nickel silver should be allowed for every gallon solution.

In dissolving the nickel silver, use only sufficient of the dilute nitric acid to dissolve the metal. The resulting solution should be added to water to make one gallon of solution; 26 per cent aqua ammonia should be added to the water until it becomes a deep blue. The three metals will be held in suspension. Sufficient sodium cyanide 96-98 per cent should now be added to the solution, until the blue color has all disappeared and the solution assumes the tint of old ale. Then filter the solution. It may be necessary to add some sodium cyanide as free cyanide, but an excess must be avoided. The solution will work well hot or cold. Anodes should be of soft annealed nickel silver. The solution will require a voltage of 3 to 4—possibly more.

The cyanides of nickel, copper and zinc can be used in the preparation of a nickel silver solution, dissolving the correct proportions of the three factors to constitute the alloy in sodium cyanide 96-98 per cent, allowing about 2 oz. of metal per gallon of solution—ammonia 26 per cent or ammonium chloride will have to be added to the solution to produce a satisfactory deposit.—C. H. P. Problem 3,239.

FINE GRAINED METAL

Q.—In making my metal for superheated high steam pressure castings, I would like to get a very fine grain in the breaking of my casting. Would I in making high steam pressure metal get a finer grain by adding 2 oz. of 15 per cent phosphor copper or not, and would it be of any benefit to my metal?

A.—We would say that 2 oz. of 15 per cent phosphor copper would not effect the grain of your metal very much one way or the other. It would, however, clean and deoxidize the metal, which would have the tendency to give you a more clean, even-grained metal. To get the fine grain you desire, in addition to using the 2 oz. of 15 per cent phosphor copper, we suggest you make an alloy of:—

40%	Nickel
10	tin
45	Copper
5	Manganese Copper

and pour into small ingots, or shot it by pouring into water. Use 1 per cent of this mixture in place of tin and see the results.—W. J. R. Problem 3,240.

MATTE FINISH ON ALUMINUM

Q.—We have a problem in our hands as follows:

We are contemplating making a large quantity of screw caps from aluminum, the finish of which should be a soft, velvety or very light matte, and we thought perhaps that some of your subscribers or technical staff could tell us the best and most economical way to get this finish. We have tried acid and it does not work. We had in mind that perhaps rolling in ground flint or powdered pumice might produce the desired effect and at the same time we were wondering if this method would discolor the metal, and if so how we could bring it back to a bright, clean condition.

A.—It should be possible to obtain the velvet or light matte finish upon aluminum by acid dipping under the following methods:

1. Remove any excess of oil or grease by immersing in hot kerosene oil, drain and dry out in sawdust.
2. Immerse in a regular hot alkaline cleaner for a few minutes until the aluminum darkens, then remove, wash in cold water thoroughly.
3. Immerse in an acid dip composed as follows:

Nitric Acid 38%	3 parts
Sulphuric Acid 66%	1 part

Immerse the aluminum articles in the acid dip for a moment or two then remove and wash in cold water. Immerse into a cold borax soap solution, using from 1 to 2 ozs. borax soap chips per gallon of water.

From the soap solution, rinse thoroughly in boiling water, then dry out by centrifugal drying or by maple sawdust. If the surface of the aluminum is not sufficiently matted for your purpose, you can cleanse the aluminum parts so outlined and then tumble with 200 mesh ground flint. Mix the flint with sawdust, preferably maple, and a little water. A small amount of tri sodium phosphate might be added ½ oz. to 1 oz. per gallon of water used.

If the articles become darkened by the tumbling method, then you will have to resort to a quick dip in the alkaline cleaner, followed by the acid dip as outlined.—C. H. P. Problem 3,241.

NICKEL BRASS

Q.—We are looking for a formula with which we can make castings that will polish up to the color and brightness of nickel plating. Will German silver do this? By adding a large quantity of nickel to a mixture will it increase the cost of machining?

A.—A mixture that has given very good results and a good color, where pressure castings are not wanted, consists of:

Copper	55%
Nickel	12%
Zinc	32%
Aluminum	1%

Adding a large quantity of nickel will increase the cost of machining.—W. J. R. Problem 3,242.

NICKEL ON SMALL DIE CASTINGS

Q.—We have a lot of small die casting parts to nickel plate. One is a knurled thumb screw with a head about 1¼ inch diameter. This is a zinc base—the other parts are aluminum base with 8 to 10% copper. We cannot plate them in our ordinary nickel tank. We would be glad to hear from you as to a solution for these and whether it is necessary to agitate the solution or not and whether it should be run hot or ordinary room temperature. We are hardly in a position, due to lack of room, to put a mechanical movement in and would like to work it out in a still tank without agitating if possible.

A.—The die castings can be plated successfully in the following nickel solution. If at all possible, the negative or work pole should be slightly agitated, either horizontally or vertically, even a 2 or 3 inch movement will be ample.

Nickel solution:

Water	1 gallon
Double Nickel Salts	8 ozs.
Sodium Citrate	4 ozs.
Common Salt	3 ozs.
Nitric Acid	1/16 oz.

Temp. 70 to 80° Fah. at 4 volts.

Cleanse the die castings in mild alkaline cleaners. A solution of:

Water	1 gallon
Soda Ash	4 ozs.
Trisodium Phosphate	4 ozs.

Temp. 180° F. will give good results. After cleaning and washing in water, immerse in a regular cyanide dip to remove any stains. Rewash in cold water and nickel plate direct. Some firms coat the die castings with a thin deposit of brass before nickel plating. This is good practice. The formula given, however, will plate die castings with or without the preliminary brass deposit.—C. H. P. Problem 3,243.

NICKEL ON STEREOTYPE

Q.—Under separate cover we are sending a piece of stereotype plate showing results which are being obtained. The nickel strips so easily from the base metal that it is impossible to cut the plates for corrections without spoiling them.

The plates are made of 86% lead and 14% antimony, and an adherent deposit .0015 inch thick is desired. What is considered a suitable nickel solution for this class of work, and what voltage and current density should be used? Would the use of a copper strike improve the results and, if so, should an acid copper or copper cyanide solution be used?

A.—It is our opinion that for perfect adherence of nickel to stereotype metal, a preliminary strike should be given to the metal in a hot nickel solution, just long enough so that the metal is thinly coated.

It should then be plated in a solution of the following composition:

Water	1 gallon
Single Nickel Salts	12 ozs.
Nickel Chloride	2 ozs.
Boracic Acid	2 ozs.
Epsom Salts	2 ozs.

Voltage 4.

Temp. 80° F., agitated cathode rod, either horizontally or vertically moved.

For the hot nickel strike the formula as above can be reduced 50%; the temperature increased to 140 to 160° F. Voltage 6.

The metal should be cleansed with a cleaner somewhat high in caustic soda. A warm copper cyanide can be used to give only a flash deposit. The metal is somewhat difficult to plate heavily with copper unless an acid copper solution is used for the purpose, following the strike in the hot copper solution.

The following formula should be used for the strike solution:

Water	1 gallon
Sodium Cyanide, 96-98%	3¾ ozs.
Copper Cyanide	3 ozs.
Soda Ash, 58%	1/3 oz.
Powdered Borax	1/3 oz.
Hyposulphite of Soda	2 to 5 grains

Temperature 120 at 4 to 5 volts. Anodes—copper.—C. H. P. Problem 3,244.

TYPE METAL

Q.—Will you kindly send us any available data on the analysis of what is known as No. 1 Type Metal.

A.—These mixtures of type metal are all termed Stereotype metal.

	Lead	Tin	Antimony
No. 1	68%	14%	18%
No. 2	35%	60%	5%
No. 3	82%	6%	12%
No. 4	82%	3.2%	14.8%
No. 5	70%	13%	17%

What is considered standard stereotype metal consists of:

82.5% Lead
4.5% Tin
13 % Antimony

—W. J. R. Problem 3,245.

WHITE METAL PATTERNS

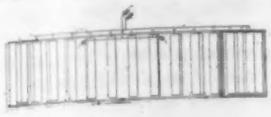
Q.—Will you kindly oblige us by giving us a formula for mixing a metal that will answer for white metal patterns in the brass foundry? Our molder makes white metal patterns but they are very soft and heavy. We think he uses nearly all lead in making them.

A.—One of the best formulas for white metal patterns, one that gives the minimum shrinkage, runs nicely and makes a very execellent pattern, consists of 50% Zinc and 50% Tin. If a very nice pattern is desired the mixture should be 55% Tin and 45% Zinc. Pour the metal at as low a temperature as possible and very fine results will be obtained.—W. J. R. Problem 3,246.

PATENTS

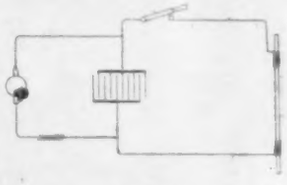
A REVIEW OF CURRENT PATENTS OF INTEREST

1,488,553. April 1, 1924. **Process of Coating Sheet Steel with Aluminum.** Samuel Peacock, Wheeling, W. Va., assignor to Willis G. Waldo, Washington, D. C.



The process of coating sheet steel with aluminum which consists in providing a molten bath consisting of a mixture of sodium and potassium aluminum fluorides at a temperature above 700° C; passing said sheet steel beneath the surface of said bath while passing a current from said bath to said sheet steel and compacting the coating produced in the bath; and gradually cooling said coating out of contact with the atmosphere.

1,489,093. April 1, 1924. **Welding Aluminum.** Ralph D. Mershon, New York, N. Y., and Percy A. Ross, Norwalk, Conn., said Ross assignor to said Mershon.

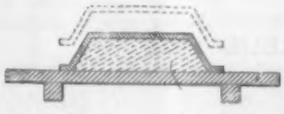


The method of welding aluminum, comprising arranging the parts in contact in the position in which they are to be welded and directly connecting the same in open circuit with both terminals of a charged condenser; and after the parts have been so arranged closing the circuit, whereby the condenser discharges at the joint between the parts and fuses them together at such point.

1,489,393. April 8, 1924. **Apparatus for Galvanizing Chain.** Winford G. Milne, Hamilton, Ont., Canada, assignor to N. Slater Company, Ltd., Hamilton, Ont., Canada.

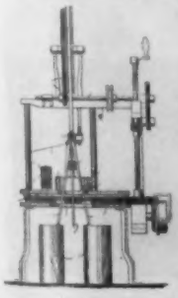
In apparatus for coating chain, the combination of a dipping tank into which the chain is led; means for withdrawing the chain from the dipping tank; and agitators for agitating the chain to remove excess coating, the movement of said agitators at the point of agitation being substantially in the same direction as the travel of the chain, but at a greater speed.

1,489,726. April 8, 1924. **Molding.** John R. Wood, Newark, N. J., assignor to New Process Multi-Castings Company, Newark, N. J.



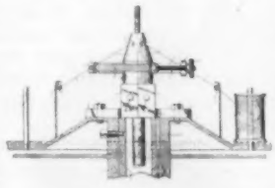
The method of making metal matched pattern plates herein described, which consists in forming cope and drag follow boards with impressions of the opposite sides of the same pattern in a hard material, making sand molds with impressions of the opposite sides of the same pattern, and by means of the same associated with but spaced from the corresponding follow boards to form molds and by means of the same, molding the matched pattern plates of relatively fusible metal.

1,489,819. April 8, 1924. **Insulated Wire-Making Machine.** William E. Cook, St. George, N. Y., and M. B. Bradt, Pennington, N. J., assignors to Peerless Insulated Wire and Cable Company, New York.



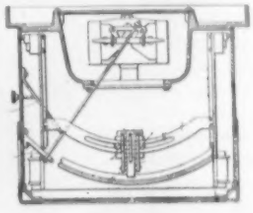
A machine for making insulated wire embodying therein means adapted to impart only lineal traverse to a wire, nonrotary means adapted to guide a strip of matted fibrous material substantially parallel with, and lay it longitudinally of, and upon, said wire, a braiding mechanism adapted to apply a plurality of strands to said fibrous material.

1,489,820. April 8, 1924. **Compacting Head for Wire-Covering Machines.** William E. Cook, St. George, N. Y., assignor to Peerless Insulated Wire & Cable Company, New York.



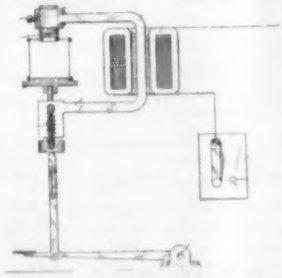
A compacting head for wire covering machines embodying therein a rotatable spindle-carrying platform and a die carried thereby and rotatable therewith including therein opposed members having registering, graduated complementary openings therein, means pivotally supporting said members adjacent the larger portions of said openings, whereby the smaller portions of said openings may have movement toward and from each other.

1,489,920. April 8, 1924. **Safety Device for Pyrometers.** Richard P. Brown, Philadelphia, Pa., assignor to The Brown Instrument Company, Philadelphia.



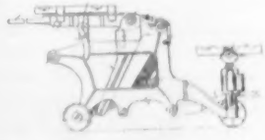
In an electrical system, a heating unit, a pyrometer arranged to control said heating unit, and means rendered operative by an inoperative condition of said pyrometer for causing said heating unit to be shut down.

1,490,087. April 15, 1924. **Means for Soldering.** Julius Brenzinger, Fairfield, Conn., assignor to The Max Ams Machine Company, Bridgeport, Conn.



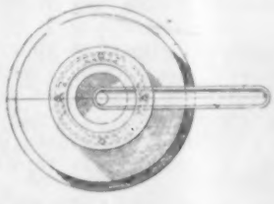
A soldering device comprising: a transformer, the secondary of which is a bracket having two terminals, a head mounted in one of said terminals, a pedestal slidingly mounted in the other terminal, and means for moving the pedestal toward and away from the head.

1,490,289. April 15, 1924. **Rock-Over Molding Machine.** George E. Pickup, Newark, Ohio, assignor to The Wehrle Company, Newark, Ohio.



Molding machine having a supporting frame, a pair of carrier members pivoted to said frame, a table pivoted to said members, means for limiting the extent of relative pivotal movement between the members and the frame on the one hand and the table and the members on the other hand, and spring means tending to assist the upward movement of the table and to resist the downward movement thereof.

1,490,482. April 15, 1924. **Mold for Annular Castings.** Wm. J. Reardon, Detroit, Mich., assignor by mesne assignments to Aluminum Manufacturers, Inc., Cleveland, Ohio.



In a mold for making annular castings in combination, a base, a core supported on the base, a plurality of curved members secured together and mounted upon the base around the core, the adjacent faces of the said base, core and side members being suitably recessed to form runner, riser and casting cavities, a gate extending through the core communicating with the said runner, and a plurality of plungers adapted to enter the riser cavities and to exert pressure upon molten metal contained therein.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

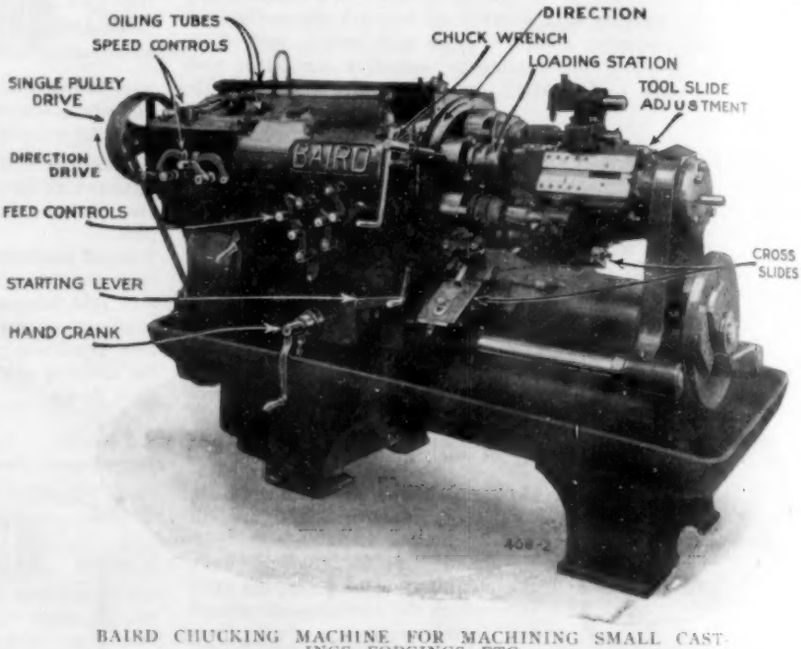
BAIRD SIX-SPINDLE CHUCKING MACHINE

A six-spindle chucking machine is now being introduced to the trade by the Baird Machine Company, Stratford Avenue, Bridgeport, Conn., on which castings, forgings, and cut-off bar stock, which can be held in a chuck while being machined may have the operations of turning, facing, chamfering, drilling, boring, reaming, threading, etc., done at one time on five pieces. The machine handles work up to 6" diameter, and 6" length. The work is held on a turret by chucks which bring each piece successively into position for being operated upon by each set of tools, one piece being finished with each turret revolution. The finished part is replaced by an unfinished part at the idle position at the front of the machine.

When the finished part reaches this position, the machine is automatically stopped, so that carelessness of the operator will not result in damage. The machine need not stop to replace the finished work, however, and it can be run without stopping, where it is more economical to do so. Fifteen tools can be mounted on the main tool carriage, fed forward to the work, and three tools can be held on each of the two cross-slides at the front and rear of the machine, a total of twenty-one tools employed on the machine at one time.

The machine is driven by a single pulley. When this pulley is run at a speed of 800 revolutions per minute, the minimum spindle speed obtained through the medium of sliding gears, shifted by means of hand-levers on the housing near the pulley end of the machine, is 28½ revolutions per minute; the maximum speed, 440 revolutions per minute. Spindle speeds between the minimum and maximum limits are obtained through eight possible combinations of the gears and three of the spindles, thus giving a total of twenty-four speeds. By this arrangement, the different spindles may at any time be revolved at three speeds. If one spindle should operate at twenty revolutions per minute, each of the four remaining spindles can be operated at either twenty, thirty or forty revolutions.

There are seventeen feeds for the tools, quickly obtained through hand-levers on the main housing. The minimum production rate with the driving pulley running at 800 revolutions per minute is one piece every nine minutes; the maximum, 2⅔ pieces per minute. The spindles may be adjusted independently to suit conditions. Each spindle is driven by means of a clutch which is disengaged during the indexing movements of the work-holding turret. Special fixtures can replace the chucks when necessary.



BAIRD CHUCKING MACHINE FOR MACHINING SMALL CASTINGS, FORGINGS, ETC.

The main tool carriage has a separate slide for each station of the turret, and there is always a choice of two lengths of feed for the slides. The tool-holders are interchangeable. The machine occupies a floor space of about 8 by 4 feet, and weighs approximately 8,500 pounds. If the machine should be motor-driven, a motor of five horsepower is sufficient.

ELECTRIC GLUE POT

This is a water-jacketed, electrically heated glue pot with a thermostatic control which provides the means for securing the highest efficiency in the application of heat to the keeping of glue at the correct working temperature. It is made in one size, two quart capacity.

DESCRIPTION

Glue pot—Cast Aluminum, of two quart capacity. The rim of the glue pot is machined to give an air tight fit on the water pot, preventing all loss by evaporation. A drip ring returns all condensation to the water pot.

Water jacket—A fine gray iron casting, ground to an air tight fit with glue pot. Outside of water pot telescopes over a rim on the base preventing the penetration of water to the heating element when refilling pot. The necessity for replacement of water occurs only at long intervals as by actual test Van Dorn Glue Pots have operated for three weeks before additional water had to be supplied.

Heating element—Nichrome ribbon, insulated by Mica plates and moisture proof. No cement is used in connection with the heating element. Cement usually requires twenty-four hours to dry properly and is easily disturbed by moisture. If replacement of the heating element or the automatic control becomes necessary the glue pot may be put back in service in twenty minutes.

Thermostatic control—A positive heat control that will consistently hold the temperature of the contents of the glue pot at 150 degrees Fahr., with a variation of less than 5 degrees regardless of room temperature. The thermostat is set at this point and fully tested before the glue pot leaves the factory. There are no outside gauges or delicate mechanisms to get out of order. A generous length of cable and separable plug furnish means of connection with the source of current for the operation of the glue pot.

Guarantee—The pot is guaranteed against electrical and mechanical defects for a period of one year.

The Van Dorn Glue Pot is made by the Van Dorn Electric Tool Company, Cleveland, Ohio.

VAN DORN GLUE POT

ELECTRIC BRAZING MACHINE

The Thornton Electric Brazing Machine is, it is claimed, one of the most economical, fastest and best machine manufactured for electric brazing. The construction is rugged, the frame being of iron, carefully fitted and put together, to insure rigidity. The transformer is almost noiseless and, it is stated, will not heat under the maximum service.

Connection is made to the brazer through a nine point control switch. This switch has a pivot handle. As it is turned from one to another of the nine contact points, the heat is intensified or decreased as desired. The greater the heat the faster will be the operation. This switch does not energize the machine. It merely predetermines the energy that will be used when the operating switch is turned on.

The operating switch is of the foot type and is placed on the floor in front of machine. When the parts are in place ready for brazing, a pressure on the switch completes an electric circuit and the joint rapidly becomes sufficiently hot to make the braze. As soon as this is accomplished, the pressure on foot switch is relieved thereby breaking the circuit. The entire operation does not take more than a few seconds.

The parts to be brazed are held in copper heads specially designed for the particular work to be done. Any number of various types of heads may be used on one machine. These heads comprise the work holding means and are provided with counterweighted automatic cams and fixtures, so designed that unusual shaped pieces may be as easily brazed as wire or rods.

The brazer illustrated is the No. 1, designed for and being used successfully in a number of the largest wire drawing mills on all sizes wire rods from ⅛" to ⅝" diameter. The manufacturers of this machine also manufacture a small portable brazer, known as No. 10 for brazing copper and brass wire from No. 10 to No. 24, B & S Gauge, also flat steel strip for armoured cable and other light brazing.

For information concerning these brazers, write to W. D. Crumpton & Company, 8-10 Bridge street, New York.

THORNTON ELECTRIC BRAZING MACHINE

EQUIPMENT AND SUPPLY CATALOGUES

Year Book, 1923—issued by the Merchants' Association of New York, 233 Broadway, New York City.

Foundry and Platers' Supplies—A folder issued by Frederic B. Stevens, Inc., Detroit, Mich., entitled "Discovered—Things We Might Sell You."

Grinding, Buffing and Polishing Machinery—A new complete descriptive catalog issued by the Cleveland Armature Works, Cleveland, Ohio.

Crown Rheostat & Supply Company, 1910 Park Avenue, Chicago, Ill., has issued folders on its Thompson acid pump, and Crown tanking lining.

"Tight Line Construction"—A folder on new leather belting construction, issued by the Graton & Knight Manufacturing Company, 356 Franklin Street, Worcester, Mass.

Liquid Fuel Furnaces—A booklet illustrating and describing "Calorex" furnaces and liquid fuel equipment manufactured by W. N. Best Furnace & Burner Corporation, 11 Broadway, New York City.

Everdur No. 50—A corrosion resistant metal—is illustrated and described in bulletin entitled Biddle Metals, issued by the Supplee-Biddle Hardware Company, 507-19 Commerce Street, Philadelphia, Pa.

Rockwell Economizer Forge Furnace—Bulletin No. 260, illustrating and describing the Rockwell Economizer Forge furnace, issued by the W. S. Rockwell Company, 50 Church Street, New York City.

Zaponites—The Celluloid Zapon Company, Park-Lexington Building, New York City, has just issued a booklet describing all of the Zapon products, and gives explicit instructions as to the proper use of each.

Ampco—A leaflet issued by the American Metal Products Company, 34th Ave. and Burnham St., Milwaukee, Wis., on Ampco acid resisting castings, ingots and billets, bearing metals, sand castings, acid valves.

New Brooklyn Plant—A pamphlet giving a general description of the new Brooklyn works of the E. W. Bliss Company, located at the foot of 53rd Street on the east shore of Upper New York Bay. It is also illustrated.

J. W. Paxson Company, Philadelphia, Pa., has issued the following leaflets: Tremont Headless Cut Foundry Nails; Combs Gyratory Foundry Riddles; Brass Dowel Pins; Tullytown Sand; Franklin Gaggers; Foundry Vibrators.

"Ventura"—A folder issued by the American Blower Company, 6004 Russell Street, Detroit, Mich., on its new model man cooling fans, for use in steel mills, foundries, forges and other plants where heat treating processes are used.

Flexmet—A folder issued by the Breeze Metal Hose & Manufacturing Company, 250-22 South Street, Newark, N. J., on H. A. Fle-X-Met square-lock carburetor hose and P. I. L. Fle-X-Met plain interlocked hose; also gives list of other Fle-X-Met products.

The **Engineering Foundation**—A booklet isued by the Engineering Foundation, 29 West 39th Street, New York, on Mr. Swasey's reasons for his gift to that Foundation which was put into the hands of the members of the State University's Advisory Board.

Allen-Bradley Company, Milwaukee, Wis., has issued the following bulletins on alternating current motor starters: Resistance Starters; Type H-1852 Semi-Automatic Resistance Starter; Type J-1552 Across-the-Line Starting Switch; Type J-3052 Automatic Resistance Starter.

Rockwell Air-Tight Blast Gates—Bulletin No. 258, containing letters from various concerns commenting the Rockwell Air-Tight Blast Gates. A table of dimensions is also included. This bulletin is illustrated. Issued by the W. S. Rockwell Company, 50 Church Street, New York City.

The **Ramsey Chain Company,** Inc., Albany, N. Y., has issued a text book on Power Transmission, and Silent Chain Transmission in particular. It is a 6 x 9, 48 page book in two colors, attractively illustrated and bound. The book treats on the comparisons between the various methods of drives, leather and rubber belting, gearing, direct drives and Silent Chain.

Thermo-Electric Pyrometers—The Brown Instrument Company, Wayne & Windrim Avenues, Philadelphia, Pa., has issued a booklet entitled Instructions for Installation and Care of Thermo-Electric Pyrometers. Part of the table of contents is as follows: Thermocouples, Terminal Heads for Thermocouples, Leads from Thermocouple to Indicator or Recorder, Eliminating Cold Junction Errors, Indicating and Recording Pyrometers.

Lubricators—Class BA catalogue issued by the McCord Radiator & Manufacturing Company, 2587 East. Grand Blvd., Detroit, Mich., contains a very detailed description of its Class BA Force Feed Lubricator with illustrations and price lists. This company has also issued a publication containing illustrations of its Class B Lubricator adapted to small steam engines, oil engines, gasoline engines, air compressors, steam pumps and auxiliaries.

Condenser Tubing—A brief non-technical description of the cupping process and other operations in connection with the manufacture of Scovill Admiralty condenser tubing, as well as the process for making Scovill special Muntz condenser tubing. In connection with this booklet the company has printed separate specifications for both Admiralty and Muntz condenser tubing which covers the manufacture, chemical properties and tests, physical properties and tests, permissible variations in dimensions and workmanship and finish. It is stated that if these specifications are adopted by the user of condenser tubing uncertainty as to the quality of condenser tubing will be eliminated.

How to Order Brass—An illustrated publication issued by the Chase Metal Works, Waterbury, Conn. What they are trying to do is to tell the purchasing agent, who is not versed in every technical detail, how to order the brass that he wants and how to specify it so that he will get it. They have urged one point particularly and that is that brass is a metal of many uses and characteristics, and that the most important thing for the user to decide is which of these is most important for his use, and then to make his specifications and instructions very definite concerning that one quality. They also call attention to the names and differences of tempers, and most especially to the tables given on pages 32-37. These tables "Common Uses and Tempers of Wrought Copper Alloys" are extremely valuable and the tolerances should help make definite a question that has been the cause of many disputes between manufacturers and customers.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

Headquarters, 140 S. Dearborn Street, Chicago, Ill.

MEDALS OF AWARD

At the Columbus Convention of the American Foundrymen's Association, October, 1920, announcement was made that four contributions of $5,000.00 each had been offered to the association, the income to be used in the making of awards and giving of prizes for the purpose of encouraging and stimulating meritorious effort in the industry of making metal castings. These contributions, which were the first to be offered to the association for such purposes, were made by John A. Penton, first secretary of the A. F. A.; Joseph S. Seaman, the third president; William H. McFadden, tenth president, and J. H. Whiting, all of whom joined the association in 1896 as charter members.

A Board of Awards was created consisting of the seven last living past presidents of the American Foundrymen's Association, with the junior past president as chairman. At their direction the funds were placed with the Harris Trust

AMERICAN FOUNDRYMEN'S ASSOCIATION MEDALS OF AWARD

& Savings Bank as trust agents, the income to be deposited to the credit of the Award Fund Account of the association.

Frederick C. Hibbard, a well known sculptor of Chicago, was engaged to design and model four medals, the obverse side of each to be the same and to bear the inscription **American Foundrymen's Association Award of Merit**; the reverse sides to have a distinctive design for the John A. Penton, Joseph S. Seaman, W. H. McFadden and J. H. Whiting medals of the American Foundrymen's Association.

Reproductions of the designs of the medals from photographs taken from plaster casts are shown in the illustrations. Dies for the medals are being made by the Metallic Art Company of New York. The medals are to be made of gold and will be two and one-half inches in diameter.

SOCIETY FOR TESTING MATERIALS

Headquarters, 1315 Spruce Street, Phila., Pa.

TWENTY-SEVENTH ANNUAL MEETING, JUNE 24-27, 1924

As previously announced, the Twenty-seventh Annual Meeting of the Society will be held at the Chalfonte-Haddon Hall, Atlantic City, N. J., during the week of June 23. Registration will start Monday, June 23.

Corrosion.—The subject of Corrosion is one of the big attractions of the meeting. The Symposium on Corrosion-Resistant, Heat-Resistant and Electrical-Resistance Alloys is creating widespread interest and unquestionably will result in the bringing together of a fund of valuable information regarding these alloys and their properties. One of the features of the Symposium is a tabulation of the composition and properties of practically all of the alloys of this type manufactured in this country. Second only in significance are the reports of the Society's two committees A-5 and B-3 on Corrosion. Papers on methods of Corrosion testing complete this part of the program.

Endurance of Metals.—The importance of this subject warrants the continued discussion of it in the Society. Three papers are to be presented which will bring before our members detailed reports of endurance tests of ferrous and non-ferrous metals made by the U. S. Bureau of Mines, the U. S. Naval Engineering Experiment Station and the U. S. Air Service.

NOMINATIONS FOR OFFICERS

The following nominations for officers reached by unanimous action of the Nominating Committee are announced:

For President: F. M. Farmer, Chief Engineer, Electrical Testing Laboratories, New York City.

For Vice-President: J. H. Gibboney, Chemist, Norfolk and Western Railroad, Roanoke, Va.

For Members of Executive Committee: William Campbell, Howe Professor of Metallurgy, School of Mines, Columbia University, New York City. A. E. Jury, Manager, Textile Section, United States Rubber Co., New York City. Anson Marston, Dean of Division of Engineering, Iowa State College, Ames, Iowa. John A. Mathews, Vice-President, In Charge of Metallurgy, Crucible Steel Co. of America, New York City.

Meeting with A. S. M. E. at Cleveland, May 29

SYMPOSIUM ON EFFECT OF TEMPERATURE UPON THE PROPERTIES OF METALS

The joint meeting with the American Society of Mechanical Engineers at which the Symposium on "Effect of Temperature Upon the Properties of Metals" was held, and the Symposium formed one of the sessions of the A. S. M. E. Spring Meeting at the Cleveland Hotel, Cleveland, Ohio, Thursday, May 29, at 9 a. m.

The subject covered by the Symposium is one of great importance. The use in central station and power plant installations, in oil refineries and elsewhere, of considerably higher temperatures and pressures than were prevalent even a few years ago, has emphasized very forcibly the importance of more exact knowledge regarding the behavior of metals at these elevated temperatures. The properties at very low temperatures also require consideration. The four papers that will introduce the Symposium constitute what is probably the most complete summary of information on the subject that has yet been published. These papers are:

Industrial Applications of Metals at Various Temperatures. L. W. Spring.

Methods of Testing Metals at Various Temperatures and Their Limitations. V. T. Malcolm.

Available Data on the Properties of Irons and Steels at Various Temperatures. H. J. French and W. A. Tucker.

Available Data on the Properties of Non-Ferrous Metals and Alloys at Various Temperatures. Clair Upthegrove and A. E. White.

With the last three papers are given bibliographies that include references to practically all the important tests that have been made. For abstracts of some of these papers see page 244 of this issue.

AMERICAN ELECTROCHEMICAL SOCIETY

Headquarters, Columbia University, New York City

NEW OFFICERS OF THE SOCIETY

At the annual business meeting of the society, Friday morning, the retiring president, A. T. Hinckley, made announcement of the election of the following new officers: President: H. C. Parmelee (1924-1925). Vice-Presidents: C. F. Burgess, Carl Hering, F. A. J. FitzGerald (1924-1926). Managers: S. C. Lind, A. H. Hooker, Duncan MacRae (1924-1927. Treasurer: F. A. Lidbury (1924-1925). Secretary: Colin G. Fink (1924-1925).

NEW OFFICERS OF THE DIVISIONS

The annual election of officers to the divisions of the society took place at the Philadelphia meeting. The results of the election are as follows:

Electrothermic Division

Chairman: G. K. Elliott. Vice-Chairman: F. M. Becket. Secretary-Treasurer: L. C Judson. Members-at-Large: H. W. Gillett and H. M. St. John.

Electrodeposition Division

Chairman: O. P. Watts. Vice-Chairman: P. D. Merica. Secretary-Treasurer: Wm. Blum. Members-at-Large: O. C. Ralston and H. S. Lukens. Foreign Representatives: W. E. Hughes, A. H. W. Aten and Bertram Wood.

METROPOLITAN BRASS FOUNDERS' ASSN.

Headquarters, Care of Wm. E. Paulson, 97 Second Ave., Brooklyn, N. Y.

The Metropolitan Brass Founders' Association held its regular monthly meeting on Wednesday, May 14, 1924, in the Builders' Exchange building, 34 W. 33d street, New York. Wm. Corse, of the National Research Council, Washington, D. C., spoke on "Nickel in Brass and White Metal," and showed several reels of moving pictures on the production of nickel and monel metal from the mine to the finished product. His lecture, which was of great value to foundrymen using nickel in their mixtures, will be found on page 234 of this issue.

ASSOCIATION OF MANUFACTURERS

Headquarters, 50 Church Street, New York

John E. Edgeton was re-elected president of the National Association of manufacturers at the annual convention which adjoined at the Waldorf Astoria Hotel, New York City on May 21, 1924. Mr. Edgeton has served for several years. Henry Abbott was re-elected treasurer and John R. Boudinot, secretary.

On Tuesday evening, May 20, 1924, the "Platform of Industry" was introduced. The platform is most comprehensive and touches on immigration problems, labor disputes, the the United States Supreme Court, association activities and other phases of business in general. Charles Cheney presided at this session as he was the chairman of the Platform of Industry Committee. It was stated that this platform will be presented to both major political parties and its adoption urged.

PURCHASING AGENTS' ASSOCIATION

Headquarters, Copley Square Hotel, Boston, Mass.

As a part of the conventon of purchasng agents a commodity Conference was held on May 21, 1924, on the subject of Non-

Ferrous Metals. W. H. Barrett, technical superintendent of the American Brass Company, spoke on "Recent Advances in the Production of Copper and Copper Alloys. S. Skowronski spoke on the development of the refining and electrolytic processes in the production of copper and zinc.

MINING AND METALLURGICAL CONGRESS

Headquarters, Wembley, London, England

Papers on metals which will be presented during the meeting, June 3-6, 1924, are as follows:

Metallurgical Research in Government Laboratories: By Dr. J. L. Haughton.

The Work of the British Non-Ferrous Research Association: By Dr. R. S. Hutton.

Aluminium and Light Alloys: By Dr. W. Rosenhain.

Metallurgical Education of University rank in Great Britain: By Professor H. C. H. Carpenter.

BRITISH INSTITUTE OF METALS

Headquarters, 36 Victoria Street, London, England

A meeting of the Institute was held at the Institution of Mechanical Engineers, Storey's Gate, Westminster, on Wednesday, June 4, at 8 p. m., when Dr. F. W. Aston, F.R.S., delivered the 14th Annual May Lecture on "Atoms and Isotopes."

Personals

OLD-TIME BRASS ROLLERS

Two cousins, James and Timothy Thompson, of Waterbury, Conn., have rolled brass for the same company, the Scovill Manufacturing Company, for a total of eighty-four years, James having started in the business in 1880 and Timothy in 1884. The business lifetime of these two men bridges the gap between the brass mills of the days of water power and rule of thumb system and the modern highly organized and specialized industry.

Both learned the trade from Timothy's father, John Thompson, who had been 40 years in the business and was accounted one of the best rollers in the state. They started in one of the earliest Waterbury mills, the ruins of which are still preserved in Hamilton Park as a memento of the early days in the industry. This was the old East mill, so called to distinguish it from the West mill of the Waterbury Brass Company, the latter still in use as part of the plant of the American Brass Company.

TIMOTHY THOMPSON JAMES THOMPSON

When they started in the business the only power was produced from the old water-wheel, still preserved as a relic, the water being brought across the road in a flume from a nearby brook. Rolling brass, in those days, was more of a secret than it is today, and its followers formed a jealous sort of guild. To break into this sacred circle required money or influence or both. As the Thompsons learned the trade from a relative, they had to pay nothing, but the elder Thompson, from whom they learned it, had to pay his instructor $100, and was taught then only because the instructor was a friend of his. No one dreamed in those days of being paid while learning.

They have seen the transition from the small rolls of the early days driven by water power, to the heavy, rapidly turning rolls of today driven by electricity. Timothy Thompson illustrated how this has increased production by saying that in the old days if he turned out 60,000 pounds a month of eyelet brass on the finishing rolls, he felt it a big showing. Now he thinks nothing of turning out 150,000 and even 200,000 pounds a month.

Aside from the rolls being run faster, time has been saved in other ways, he states. Then, the pans of brass had to be pushed into the muffles for annealing by sheer man power. Now there is an electric pan puller to pull the pans in and out. Also, there used to be but one door to the muffles and room for but one pan. The muffle men, after putting one pan in, would have to wait for about two hours until the brass was annealed and all the time would have nothing to do but sit and smoke. They had to pull it out through the same end at which it went in. Now double muffles with room for four pans, two ahead of each other, are in use. When one pan is annealed it is pulled out at the opposite end from which it came in, and another pan, which has been in not quite so long, is moved up, and still another pan is pulled into the muffle from the back end. This keeps the brass moving all the time.

In the old days when the bars came off the rolls, they were piled up on the floor, a hand truck came up for them, they were loaded on the truck, drawn to the muffles, taken off and piled up on the floor again and finally loaded on the pan to be put into the muffles. Now this is all done in two operations. The bars coming off the rolls are immediately piled on a pan, which is resting on a truck right beside the rolls. An industrial or electric storage battery truck hooks onto it and draws it to the muffles, where the pan is immediately drawn into the muffles by the pan puller.

In the old days the rollers were hired according to what they could turn out. Timothy was hired on three months' trial, with the understanding that if he turned out 60,000 pounds a month he would be given what he asked. The man then on the job was not making that, and neither did Timothy, during the first month; but the second month he exceeded his quota.

H. H. Schreuder has been appointed eastern sales representatives for the National Engineering Company, Chicago, Ill., manufacturers of Simpson Sand Mixers and other foundry equipment. Mr. Schreuder will be at 50 Church street, New York City.

John J. Crowe has resigned the position of metallurgist in charge of the testing and research laboratory at the Philadelphia Navy Yard to accept the position of engineer in charge of the Air Reduction Company's apparatus research and development laboratory at Jersey City, N. J.

George F. Anglin, formerly associated with Pittsburgh Knife and Forge Company, Pittsburgh and Coraopolis, has been appointed Pittsburgh manager of the Blake & Johnson Company, Waterbury, Conn., and will have full charge of sales of cold strip mill apparatus for that company in the Pittsburgh district and Ohio.

W. M. Corse of the National Research Council, Washington, D. C., has accepted the invitation to deliver the Third Annual Autumn Lecture before the British Institute of Metals in London, England, on the evening of September 8. This lecture is of a popular nature. Mr. Corse is planning to include a description of some recent American metallurgical advances, together with pictures of various plants showing mass production.

Dr. Richard Moldenke, Watchung, N. J., addressed the New England Foundrymen's Association April 9th at Boston on the subject "A Foundrymen's Experience in Europe in the Fall of 1923," describing the Hamburg meeting and exhibition of the German Foundrymen's Association; the visit of the American Foundrymen to British foundry centres; the International Foundrymen's meeting in Paris and the meeting of the British Iron & Steel Institute in Milan, Italy. He also gave personal reminiscences of travel and interviews with prominent statesmen and industrial leaders abroad.

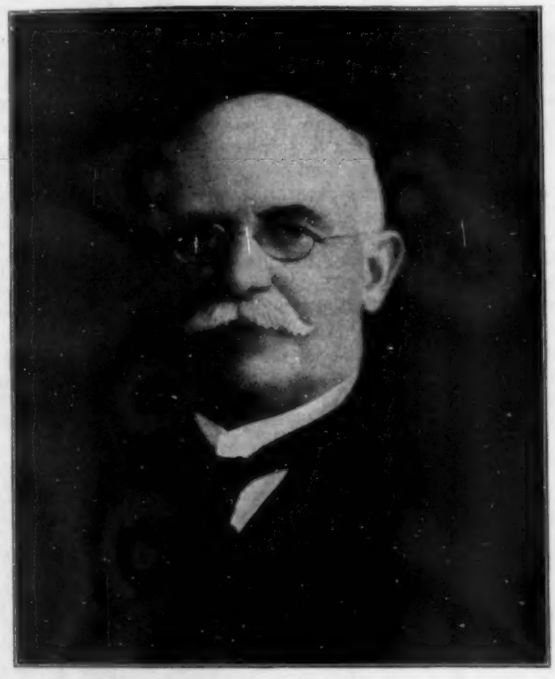
Deaths

GEORGE EDWARD LONG

George Edward Long, former vice-president and a director of the Joseph Dixon Crucible Company, died on May 21, after a long illness, at his home in Ridgewood, N. J.

Born in Huntington, Long Island, on March 25, 1850. Mr. Long had an active life. In his early youth, he moved to South Norwalk, Conn., and later to Chicago, returning, in 1877, to Jersey City, N. J. In 1877 he was employed by the Dixon Company and from that time his rise was rapid.

He served this company as secretary from April 20, 1891, to May 31, 1907; as treasurer from May 31, 1907, to October 21, 1912; as vice-president from October 21, 1912, to April 19, 1920; at which time he resigned. He was also a director from January 20, 1902, until his death. In December, 1898, Mr. Long founded "Graphite," the house organ of the Dixon Company which has been published continuously since.



GEORGE E. LONG

It would be difficult to enumerate in detail the contributions that Mr. Long made toward the growth of the Dixon Company's business during his service of forty-seven years. He was recognized as the "Daddy" of graphite lubrication as well as silica-graphite paint for protective purposes. Similiarly in advertising circles, he was recognized as an advocate of ample publicity for Dixon's products. But, as already indicated, these specific items can only suggest Mr. Long's wide usefulness during his period of service.

He was a member of the Ridgewood Lodge of Elks, the City Club of New York and the Society of American Magicians. He was also a member of the Carteret Club while formerly residing in Jersey City. Mr. Long is survived by his daughter, Mrs. Hamilton Cross, of Ridgewood, and by a half-brother, Eben Long, of East Orange. Funeral services were held from St. Mark's Church, Jersey avenue and York street.

ROBERT KIRKUP

Robert Kirkup died on February 1, 1924, from injuries received when he fell down a flight of stairs in his foundry. Mr. Kirkup was founder of Robert Kirkup & Company, brass foundry, Cincinnati, Ohio. He was in his 92nd year.

THEODORE EATON CONKLIN

Theodore Eaton Conklin, former president of the T. E. Conklin Brass & Copper Company, 54-60 Lafayette street, New York City, died on Tuesday, May 6, 1924, at his home in New Rochelle, N. Y., where he had been confined for several months. Had he lived until Friday, he would have attained his seventy-third year.

He was one of the largest jobbers in the East in brass, bronze and copper products, with which business he had been identified for over fifty years. He was active in the management of the business up to several years ago and had been sole proprietor until January 1, 1924, when the business was incorporated.

Mr. Conklin was one of the oldest residents of New Rochelle, having taken an active interest in its growth.

THEODORE E. CONKLIN

Mr. Conklin is survived by his wife and four sons, three of whom are actively engaged in carrying on his business.

DR. HEINRICH OSCAR HOFMAN

On April 28, Dr. Heinrich Oscar Hofman died at Cambridge, Mass. Dr. Heinrich was professor of metallurgy at the Massachusetts Institute of Technology. He had a paralytic stroke in the spring of 1920, but had been able to get about until last winter, though with increasing difficulty. One of the earliest books published by Engineering & Mining Journal, was Dr. Hofman's book, "Metallurgy of Lead and the Desilverization of Base Bullion," issued in 1882. It ran through numerous editions with minor revisions until Dr. Hofman revised it fully for inclusion in his Metallurgical Series in 1918, which consisted of three exhaustive works—"General Metallurgy," "Metallurgy of Copper," and "Metallurgy of Lead." Ill health prevented Dr. Hofman from completing his volumes "Metallurgy of Gold and Silver" and "Metallurgy of Minor Metals." Dr. Hofman was made honorary member of the American Institute of Mining Engineers in 1921 and professor emeritus, Massachusetts Institute in 1922.

EDWIN C. SPEAR

Edwin C. Spear, 68 years old, treasurer and manager of the Cheney Bigelow Wire Works, died in his home in Bellevue avenue, Springfield, Mass. He had been ill several months. Prominent in Masonry, he was one of the comparatively few Western Massachusetts men on whom the 33rd degree had been conferred. Mr. Spear was born in Chester on December 1, 1855, and was educated in the public schools of Easthampton and began working early in life. In 1898 he was made treasurer of the corporation and general manager of the plant and had been 38 years with the company.

ALBERT L. SWETT

Albert L. Swett died at his home in Medina, N. Y., April 12. Mr. Swett was head of the A. L. Swett Iron Works, Medina, N. Y., operator of gray iron and brass foundries. He also was head of the Medina Manufacturing Company, manufacturer of hardware specialties and formerly was president of the Western New York Utilities Company. Mr. Swett's death was due to injuries sustained in an automobile accident last fall.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

NEW ENGLAND STATES

WATERBURY, CONN.

JUNE 2, 1924.

Directors of local industry do not believe that the slackness that exists in some lines of manufacture in the city at the present time will last very long nor that the summer will bring about any duller conditions. All agree that the present political situation has considerable to do with it and that there is no serious underlying cause for the general condition. Most of the plants have departments working on both full time and short time. Practically all have some departments working five and one-half days, some five and some only four, while some departments, such for instance, as screw machine, are working overtime. The Department of Labor reports of Waterbury for the month of April, "All plants are running full time, with overtime noticed in certain departments of the brass factories at Waterbury, according to the April industrial survey. Industrial conditions showed an improvement during April with increased employment as compared with previous months. There is overtime noted in certain departments of the brass factories."

Patrick Robinson, for many years a foreman at the Scovill Manufacturing Company, and recently in charge of the company's manufacture of **Hamilton Beach** vacuum cleaners, has been transferred to the company's plant at Racine, Wis., of which he is to be superintendent. This plant is to take over wholly the manufacture of the vacuum cleaners, hitherto manufactured in both plants. Mr. Robinson has been chosen as superintendent of the new plant because of his familiarity with the manufacture of cleaners. Lately he has been obliged to make frequent trips back and forth between the two plants because of the division in the manufacture of the cleaners between the two. This was one reason for the decision to center their manufacture at Racine, where he will be permanently.

Waterbury's pre-eminence as a brass city and its rapid growth, both in spite of the handicap of being an inland city and with few natural advantages, is due to its being a "know how" city, according to **John A. Coe,** president of the American Brass Company, in an address to the **Unico** club here, last month. Generation after generation of skilled brass makers imbued the technique of brass making into the blood so that artisans here, in some way, were born into the business and could turn out better brass than those without this heritage, he said. That is why that when brass industries start up in other sections, without exception they come here to get their skilled men to manage their plants. The brass industry doubles every 10 years, and he said he could see no reason why this rule should not hold good in the future as in the past.

Affairs of the **Eastern Brass and Ingot Corporation,** long a tangled mess, have not yet been straightened out in spite of the bankruptcy sale of the plant to Attorneys **Marcus** and **Henry Weisman.** Federal State and City Governments, each claims taxes for more than the amount realized by the sale of the plant and there is a mortgage on property held by a western bank for $100,000 more. A hearing will be held in Washington shortly before the Board of Income Tax Appeals on the Federal Government's claim for taxes. Pending settling of the various claims for taxes, payment of the $58,000, sale price of the plant has been held up.

John A. Coe, president, and **C. F. Hollister,** treasurer, of the American Brass Company, attended the annual convention of the **National Industrial Conference Board,** held at Hotel Astor, New York City, last month. This board is devoted to industrial research and includes in its membership the heads of most of the large industries of the country. It represents employers of 7,000,000 people.

Walter S. Berry, director of apprentice training at the Scovill Manufacturing Company, addressed the Kiwanis club at its luncheon, May 13th, on factory training of young men to enter trades.

John A. Coe, president of the American Brass Company, has been elected president of the local Y. M. C. A., succeeding **W. W. Bowers,** former general manager of the Oakville Company.

WATERBURY'S SHOW

Close to 100 local concerns are co-operating in the Industrial Exposition given here June 2-7, showing chiefly the great variety of brass, copper and other metal products manufactured in the brass city. It is held in conjunction with the city's 250th anniversary celebration. Among the 100 concerns having exhibits are the city's largest brass plants such as **American Brass, Scovill's Chase companies, International Silver, American Ring, Farrell Foundry, American Pin, French Manufacturing, Bristol company, Berbecker & Rowland, Manufacturers' Foundry, Waterbury Clock,** Risdon company, **Waterbury Button, Waterbury Buckle, Patent Button, Thinsheet Metals, Somers company, Waterbury Rolling Mills, Hoffman Specialties, Plume & Atwood's, Randolph-Clowes, Steele & Johnson's, Blake & Johnson's, Smith & Griggs, Oakville Company,** and many others.

The **Copper & Brass Research Association** will have an exhibit. The United States Department of Commerce is sending two of its best metal experts here to give talks at the exposition on the subject of foreign trade as applicable to the brass and brass products industry. Rooms will be set aside in the exposition hall where these experts may hold conferences with all who wish to consult them. All the afternoon of June 3 will be devoted to these conferences, and the men are also expected to speak at the Rotary and Kiwanis clubs' luncheons.—W. R. B.

BRIDGEPORT, CONN.

JUNE 2, 1924.

The **United Illuminating Company** must open its books for inspection by the **Bridgeport Brass Company,** Judge John W. Banks of the Superior Court has ordered, following arguments of the Brass company in the suit of the Illuminating company against the former for a $20,000 bill for electricity. The firms have a contract in which the price of coal regulates the charge for electricity. The period in question in the suit is from February to April, 1922, during the coal shortage. The complaint states that more than $7.50 per ton was paid for coal in that time and basis its action on this issue. The Brass company wishes to inspect the Illuminating company's books to determine the exact cost of the coal to the company.

W. R. Webster, vice-president of the Bridgeport Brass Company, has been named chairman of the committee of the state Chamber of Commerce to make a study and investigation of the needs of the Connecticut Agricultural College.

The **Bridgeport Safety Emery Wheel Company** will build a new factory at Stratford to be started in the near future by W. R. Muirhead & Son. The building will be one story high, but will cover a large area, the dimensions being 90 by 240 feet. The work will be rushed to completion for early occupancy. Work was expected to start June 1st.

An involuntary petition asking that the **Berkshire Manufacturing Company,** of 65 Ogden street, this city, be adjudged bankrupt, has been filed with Bankruptcy Referee John Keogh. Claims of three petitioning creditors include: **MacDermid Company,** of Waterbury, **Wetherell Brothers,** of Cambridge and **George Finkelstone,** of Bridgeport. Allegation is made that the company, manufacturers of metal articles, knowing that it was insolvent, took steps to transfer assets to the detriment of the creditors.—W. R. B.

TORRINGTON, CONN.

JUNE 2, 1924.

While Torrington plants are operating under somewhat curtailed schedules and with slightly decreased working forces,

this condition is believed by those in close touch with the situation to be merely temporary and an early return to full schedules is anticipated. The present condition is due to the fact that jobbers are ordering close to actual needs in expectation of price reductions. Practically all lines in the metal industry appear to be affected, and the result is reflected immediately in orders for steel and other raw materials. Nearly all the Torrington plants are operating on 55-hour schedules, though three plants are on 50 hours. In one shop employing 1,200 hands, there have been 156 laid off in the past several weeks but nearly all of those laid off have been married women whose husbands are employed or workers under 17 years of age. Few heads of families are idle.

Figures obtained by **The Metal Industry** correspondent indicate that out of 6,200 workers in all the factories in Torrington, 425 have been laid off in the past six weeks. The number still employed, however, is larger than was employed in these same shops in 1916.

E. C. Franklin, for many years electrician at the **Torrington Branch** of the **American Brass Company,** suffered a double affliction during the past month. His son, **Harlan C. Franklin,** a junior at Yale, met a tragic death on May 18, together with **Hayner A. Bouillon,** only son of **Constant Bouillon,** of the **Hendey Machine Company,** in attempting to save two other young men from the waters of the Housatonic river at Derby. Following her son's funeral, **Mrs. Franklin,** who was recuperating from a long illness, was fatally stricken, surviving her son by only a few days.—J. H. T.

NEW BRITAIN, CONN.

MAY 27, 1924.

Business generally in this city is showing a marked let-up and in some of the concerns shorter hours have been ordered because of a lack of business. The **Traut & Hine Manufacturing Company** and the **North & Judd Company** have curtailed working hours to some extent and in practically every other plant in the city the payrolls are being cut down and employes who are considered unessential are being let go. It is becoming increasingly difficult for labor, skilled or unskilled, to secure employment.

Not only has the market for goods for domestic use been seriously affected, but also the foreign trade is slumping badly in almost every instance reported. Whether or not this slump is a pre-election let-down or whether it is something more serious the various officials of different concerns will not attempt to state. They do intimate, however, that they do not anticipate anything approaching an industrial crisis and some have gone as far as to predict that business will promptly pick up following the November elections.—H. R. J.

MIDDLE ATLANTIC STATES

ROME, N. Y.

JUNE 2, 1924.

The **Rome Brass & Copper Company** has recently acquired the buildings, machinery and assets of the **Rome Hollow Wire & Tube Company.** The latter company is a manufacturer of very small seamless brass and copper tubing, buying tubes in large sizes of the Rome Brass & Copper Company and drawing them down to the finer sizes.

The present mill of the Hollow Wire Company, located on Railroad street, just east of the plant of the Rome Wire Company, has been sold to the **Rome Wire Company.**

The machinery of the Hollow Wire & Tube Company will be moved to a new mill now in the course of construction located at the East Mills plant of the Rome Brass & Copper Company. The main part of the new mill will be 120 by 300 feet, with an "L" 50 feet by 75 feet. It will be of structural steel and brick construction, with concrete floors, steel sash, and gypsum roof, making it a strictly fireproof building throughout, in planning the building and laying out the installation of the machinery great care has been exercised to secure the greatest efficiency in manufacture. Dawson Bros., Syracuse, have the masonry contract, and the Williams Bridge Company, of Syracuse, is furnishing and erecting the structural steel. It is expected that the building will be completed and ready for occupancy by Aug. 1.

The Brass & Copper Company is also building an addition to their seamless tube mill. The present mill is 112 by 585 feet, and one bay 56 feet by 585 feet is being added to the north side of the building. The steel work for this addition is all erected, and W. G. Jones, of this city, who has the masonry contract, expects to complete his work within four weeks. When this addition is completed it will give the Brass & Copper Company increased facilities for the manufacture of seamless brass and copper tubing, and a portion of the addition will be used by their brass rod department. The building at present occupied by their brass rod department will be used for expanding the copper bar department.—M. J. D.

ROCHESTER, N. Y.

JUNE 2, 1924.

The month of May has not been illuminating so far as business among Rochester industries is concerned. In fact, activity has subsided to such a marked degree that scores of workers have been laid off in the various plants about the city. The slackening of business is not confined to the larger manufacturing institutions, but includes practically every producing establishment in Rochester. The metal-using plants are hit quite hard in some instances.

Inquiry among brass workers reveals the fact that business activities have fallen away fully 40 per cent since last month, and it is said that fully 200 workmen are unemployed at this time. The electro-plating shops about the city report an extremely dull season, and the same is true in the silver-plating works and brass foundries generally. Demand for aluminum and lead continues fair, while tin and copper are very quiet.

Heads of factory departments using non-ferrous metals admit a general slowing down in orders and anticipate no change for the better until fall. None have charged conditions due to the fact that this is a presidential election year, but in some of the larger plants there is a disposition to criticize the influence of Congress as having interrupted a prosperous season, which was apparently assured at the beginning of the present year.

Building energy in Rochester is continuing with unabated vigor, which fact has contributed not a little to counteract dullness in the trades employing non-ferrous metals. Jobbers report a fair trade in brass sheets and rods, brass wire, copper sheets, aluminum and zinc.—G. B. E.

NEWARK, N. J.

JUNE 2, 1924.

Newark metal concerns continue busy and the craze over the radio is responsible to some extent for an increase in business. There has been a large demand for aluminum goods. The **Crane Company,** of 84 Mechanics street, has purchased the large property on Mulberry street from the Manufacturers' Can Company, of Harrison, N. J. The company will erect a three-story building comprising 40,000 square feet.

Federal Judge Runyon has appointed **H. Theodore Sorg** as temporary receiver for the **Newark Metal Findings Company,** jewelry manufacturers, of 32 Green street. The bill of complaint was filed by a creditor of the company and also a stockholder. The liabilities of the company are $8,029 and the assets at $10,000.

Newark concerns recently incorporated, which metal concerns are interested include:

Ehrlich & Sinnock, manufacturing jewelry, $200,000 capital.

Radio Tube Corporation, to manufacture radio tubes, $125,000 capital stock.

Schickerling Products Manufacturing Company, to manufacture radio vacuum tubes; $50,000 capital stock.

Industrial Art Institute, Inc., to make engravings; $100,000 capital stock.—C. A. L.

TRENTON, N. J.

JUNE 2, 1924.

Conditions show decided improvement in the metal industry plants in Trenton and some of the concerns have increased working hours during the past month. **The Jordan L. Mott Company** has received a number of large orders and has placed the brass department on two working shifts of eight hours each. It is expected that the double shift will be kept on for some time.

It is said that the metal industries of New York are showing a tendency to remove to New Jersey. A survey was made and this covered manufacturing plants in every branch of the metal industry. It is reported that the migration of metal plants from New York to New Jersey has been in progress for some time. The action on the part of manufacturers appears to be the need for larger tracts of land and cheaper land than is now obtainable in the New York region.

Colonel **Washington A. Roebling**, president of the **John A. Roebling's Sons Company**, Trenton, N. J., on May 23, celebrated his eighty-seventh birthday by entertaining a number of friends at his home. He spends the greater part of each day at the big Roebling plant attending to business. Colonel Roebling, builder of the Brooklyn bridge, and head of one of the largest wire rolling mills in the world, still enjoys good health and derives pleasure both from his business activity and his recreation.

The John A. Roebling's Sons Company is working on an order for two million pounds of copper wire to be used to electrify part of the **Virginia Railroad Company's** system terminating in Norfolk, Va. The copper wire department at the Roebling plant is very busy. The concern is erecting a $200,000 addition to the copper wire department. The Roebling company expects to receive other big copper wire contracts from the Virginia Railroad Company.

The **Trenton Smelting & Refining Company**, a subsidiary of **B. Lissberger Company**, of Philadelphia, has been taken into the **Federated Metals Corporation**, a recently incorporated firm formed from the consolidation of the three companies specializing in the refining and smelting of secondary metal. Expansion of the Trenton plant on a large scale is promised for the near future. The Trenton plant is capable of a daily output of two carloads of zinc, which is made in the form of sixty pounds slabs.

Federal Judge Joseph L. Bodine has been sustained by the United States Supreme Court in directing children of the late **Charles G. Roebling**, president of the John A. Roebling's Sons Company to pay an additional income tax of $356,178.95 for the rear of 1917. This assessment was subsequently revised to $240,120.31. The case was carried to the United States Circuit Court of Appeals and later to the United States Supreme Court. During the year 1917, the Roebling company paid an extra dividend of $1,500,000, due to heavy war orders. The Roebling capitalization is $15,000,000 and the ten per cent extra stock dividend was declared from the surplus profits.

The Metals, Inc., with offices at 33 West State street, Trenton, N. J., has been incorporated with $100,000 capital to manufacture various metal products. The incorporators are Harry C. Hand, A. Roy Myers and Samuel C. Wood, all of New York.—C. A. L.

PITTSBURGH, PA.

JUNE 2, 1924.

A slight increase in the volume of business during the last two weeks of this month indicates an early turn for the better in the various manufacturing industries of this district and throughout the state as a whole. While it was not large, yet it showed improvement. Underlying what manufacturers say is a promising prospect for better business is the slight increase in the price of scrap. They assert that the scrap market points the way to better business conditions.

In the hardware industry, the increased demand for seasonal goods is expected to carry general business well into the summer on a good volume of sales, and from July on it is expected business conditions will more active.—H. W. R.

MIDDLE WESTERN STATES

INDIANAPOLIS, INDIANA

JUNE 2, 1924.

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Detroit claims the largest contract japaning plant in the world in the **Wolverine Enameling Company**, which was organized three years ago under the title of the **Wolverine Auto Painting and Trimming Company.** This plant is located at 5203-5219 Martin avenue and has every device for doing fine work that science can provide. This concern specializes in hoods, fenders, side splashers, lamps, bumpers, garnish moldings, instrument boards and all sheet metal parts. The officers of the company are P. C. McEwen, vice-president; Melvin C. Baker, secretary, and P. A. MacDonald, treasurer.

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other materials used in a single day's production of radiators comprises 38 tons of sheet metal, six tons of terne plate, 67 tons of brass, 9 tons of solder, 18,000 malleable castings, more than 4 miles of brass tubing for drains and 1,068 gallons of acid. In the making of a single radiator, more than 140 operations are necessary and every step of the manufacturing process requires unusual care.

The **Gerson-Carey Company** has forwarded a communication to the city council of Kalamazoo, Mich., setting forth that damages would be asked should the city proceed with the erection of a proposed viaduct at Kalamazoo street over the New York Central Railroad tracks. It is stated that the proposed viaduct would require the building of a new brass foundry elsewhere that would cost approximately $31,000.

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The merger of the **Great Western Smelting & Refining Company,** which has its headquarters in Chicago, with a number of other companies is expected to have little effect on the business or personnel of the Great Western company immediately, according to officials of the company. The merger was announced at New York on May 20. Among the companies included in the merger is the **Missouri Zinc Company,** Beckemeyer, Ill.

Charles Reitler, father of **President Ivan Reitler,** and **David Blum** began without capital but with plenty of nerve and willingness to work. Their small business has grown into the Great Western. The new corporation, it is announced, will be the largest distributors of old metals in the world and the largest distributors of new metals in the United States. It will deal in scrap metals, will recover tin, lead and zinc and will produce pig iron metal and alloys, white metals, mixed metals, etc. The Chicago Journal of Commerce declares that the new Federated Metals Corporation will be to the metal industry what the United States Steel Corporation is to the steel industry.

Charles M. Schwab, who is one of the directors of the new corporation and who several years ago became associated with **B. Lissberger,** of New York, in zinc ore fields in the southwest, was the first to drop a hint in Chicago of such a merger as has just been announced. When Mr. Schwab came to Chicago several years ago to address the American Zinc Institute he visited the Great Western works at 600 West Forty-first street and spoke of the possibilities of combining several large eastern metal companies with the Great Western. He pointed out the difference such a consolidation would make in distributing products and in service to consumers.

The metal business in Chicago is steady and almost normal, according to executives of a number of companies. Specialty departments are reported to be especially busy. Most plants are operating at 70 to 75 per cent of normal, it is said. Prices are declining, and the markets are soft.

L. M. Northrup, formerly with Joseph T. Ryerson & Son, steel manufacturers, has joined the **Hoyt Metal Company** as a special representative handling bearings, according to announcement by **George J. Sharkey,** of the Hoyt Company.

The Secretary of State of Illinois has authorized the **Illinois Copper & Iron Manufacturing Company,** of Chicago to increase its capital stock from $5,000 to $15,000.—L. H. G.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

MAY 16, 1924.

Fears of labor troubles have had much to do with the slow progress of trade improvements. Uncertainty as to future prices deterred both producers and customers from committing themselves far ahead. Fuel is already both scarce and dear and experience of former coal strikes made the prospect of another stoppage of supplies appalling. Progress in the building trade has been checked by uncertainty as to the labor situation and the contributory metal industries have suffered to a corresponding extent. There still remains another cause for apprehension in the movement in the engineering trades for a general advance of wages, the demand in a number of cases being for an additional £1 per week. In this movement the women and other unskilled workers are taking part. No progress has yet been made in negotiation. But the settlements announced recently in cases just as grave suggest that here again a peaceful way out may be found.

Employers and work-people in the metal trades have taken to some extent a part in the agitation generated by the announcement of the Chancellor of the Exchequer, Philip Snowden, in his Budget speech last week that what are known as the McKenna duties will be dropped on August 1st. These duties, at the rate 33 1/3 per cent, were imposed during the war upon imported motor cars, motor cycles, musical instruments and a few other articles and were avowed to be only of a temporary character. A campaign in favor of the retention of the duties was commenced and statements were circulated as to immediate and prospective dismissals of work-people, cancellation or reduction of car production and of orders for motor materials and accessories. But Mr. Snowden has not yielded an inch, and in the House of Commons this week he obtained a substantial majority for his policy.

Business in the metal trades has been somewhat quiet during the past month but signs of improvement are observable. Demand for brass and copper strip and sheet has begun to increase but the tube trade continues dull. In scrap metal very little business is being done. Orders whether for finished goods or for material are of small bulk and the genuine insistence on immediate delivery indicates that stocks are being kept as low as possible. Prices, however, keep fairly firm in the expectation that the present lull in demand will shortly pass away. An increase of 5 per cent on selling prices of all brass foundry was announced a forthnight ago. The jewelry trade except in cheap articles shows no improvement and electro-platers are still getting very little really profitable business. Aluminum hollow-ware for domestic purposes is making good headway against enamelled and cast goods.

The Birmingham Section of the British Industries Fair which was opened this week, and at which the metal and engineering trades are chiefly represented, has been visited by a great number of foreign and colonial traders. It is reported that better business has been done than at last year's fair.

An important amalgamation of British copper manufacturers has just been completed. The three firms concerned are **Vivian & Sons, Limited** and **Williams Foster & Company** and **Pascoe Grenfell & Sons, Limited.** These companies own extensive works in the neighborhood of Swansea and are large manufacturers of copper, yellow metal and spelter. The Williams Foster Company, which also owns the business of **Grice, Grice & Sons, Limited,** of Birmingham, brass and copper tube manufacturers, has an issued capital of £100,000 in perference and £250,000 in ordinary shares.—G.

TRENTON, N. J.

JUNE 2, 1924.

Conditions show decided improvement in the metal industry plants in Trenton and some of the concerns have increased working hours during the past month. **The Jordan L. Mott Company** has received a number of large orders and has placed the brass department on two working shifts of eight hours each. It is expected that the double shift will be kept on for some time.

It is said that the metal industries of New York are showing a tendency to remove to New Jersey. A survey was made and this covered manufacturing plants in every branch of the metal industry. It is reported that the migration of metal plants from New York to New Jersey has been in progress for some time. The action on the part of manufacturers appears to be the need for larger tracts of land and cheaper land than is now obtainable in the New York region.

Colonel **Washington A. Roebling**, president of the **John A. Roebling's Sons Company**, Trenton, N. J., on May 23, celebrated his eighty-seventh birthday by entertaining a number of friends at his home. He spends the greater part of each day at the big Roebling plant attending to business. Colonel Roebling, builder of the Brooklyn bridge, and head of one of the largest wire rolling mills in the world, still enjoys good health and derives pleasure both from his business activity and his recreation.

The John A. Roebling's Sons Company is working on an order for two million pounds of copper wire to be used to electrify part of the **Virginia Railroad Company's** system terminating in Norfolk, Va. The copper wire department at the Roebling plant is very busy. The concern is erecting a $200,000 addition to the copper wire department. The Roebling company expects to receive other big copper wire contracts from the Virginia Railroad Company.

The **Trenton Smelting & Refining Company**, a subsidiary of **B. Lissberger Company**, of Philadelphia, has been taken into the **Federated Metals Corporation**, a recently incorporated firm formed from the consolidation of the three companies specializing in the refining and smelting of secondary metal. Expansion of the Trenton plant on a large scale is promised for the near future. The Trenton plant is capable of a daily output of two carloads of zinc, which is made in the form of sixty pounds slabs.

Federal Judge Joseph L. Bodine has been sustained by the United States Supreme Court in directing children of the late **Charles G. Roebling**, president of the John A. Roebling's Sons Company to pay an additional income tax of $356,178.95 for the rear of 1917. This assessment was subsequently revised to $240,120.31. The case was carried to the United States Circuit Court of Appeals and later to the United States Supreme Court. During the year 1917, the Roebling company paid an extra dividend of $1,500,000, due to heavy war orders. The Roebling capitalization is $15,000,000 and the ten per cent extra stock dividend was declared from the surplus profits.

The Metals, Inc., with offices at 33 West State street, Trenton, N. J., has been incorporated with $100,000 capital to manufacture various metal products. The incorporators are Harry C. Hand, A. Roy Myers and Samuel C. Wood, all of New York.—C. A. L.

PITTSBURGH, PA.

JUNE 2, 1924.

A slight increase in the volume of business during the last two weeks of this month indicates an early turn for the better in the various manufacturing industries of this district and throughout the state as a whole. While it was not large, yet it showed improvement. Underlying what manufacturers say is a promising prospect for better business is the slight increase in the price of scrap. They assert that the scrap market points the way to better business conditions.

In the hardware industry, the increased demand for seasonal goods is expected to carry general business well into the summer on a good volume of sales, and from July on it is expected business conditions will more active.—H. W. R.

MIDDLE WESTERN STATES

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Business Items—Verified

The **Capitol Brass Works,** Chene and Franklin streets, Detroit, Mich., is building an addition to its factory.

The **Charles J. Bogue Electric Company** has moved from 513 W. 29th street to 132 King street, New York.

Haines, Jones & Cadbury Company, 1136 Ridge street, Philadelphia, Pa., is contemplating erecting a jobbing house, at Richmond, Va.

F. L. & J. C. Codman Company, 15 Elkins street, South Boston, Mass., is erecting a plant at Detroit, Mich., estimated to cost around $30,000.

The **Kirsch Curtain Rod Company,** Woodstock, Ont., Can., has started work on a two-story factory to cost $25,000. Equipment will be purchased.

The **Kirsch Manufacturing Company** of Canada, Woodstock, Ont., Can., metal specialties, will build a new factory. The company is interested in new equipment.

The **E. A. Eddy Machinery Company,** Providence, R. I., is in the market for an E.G. 54 Ferracute toggle embossing press, an 800-ton coining press and an 800-ton toggle embossing press.

Philadelphia Rust-Proof Company, Howard and Montgomery avenues, Philadelphia, Pa., is exclusive representative in Pennsylvania for the Park Rust-Proof Company and the Udylite Company.

The **Apollo Metal Works,** La Salle, Ill., manufacturers of Apollo Nickelzinc, which is used extensively in the manufacture of washing machines, will enlarge its factory to three times its present size.

The new rolling mill of the **American Metal Products Company,** Milwaukee, Wis., will handle rod and sheet, and in addition to its own metal will accept custom orders for rolling of various brass mixtures.

Frederick L. Carlton has purchased the old established plating shop of R. Kraus, 207 Centre street, New York. He will continue the business with the addition of a nickel department at the same address.

The **Rockford Brass Works, Rockford, Ill.,** will construct a foundry and factory building to cost $70,000. This firm operates the following departments: brass, bronze and aluminum foundry, brass machine shop.

Pennsylvania Bronze & Brass Company, Philadelphia, Pa., has purchased property at the S. W. corner 22nd and Harlan streets, Philadelphia, Pa., which the company has occupied for the past two years as a foundry.

The **Simplex Foundry Company,** 333 Dennison avenue, Columbus, Ohio, specializing in bronze, copper and aluminum castings, has completed an addition to its foundry of 6,000 sq. ft., thereby doubling its capacity.

The **Newark Patterns Works,** 39 Avenue L, Newark, N. J., has filed plans for an addition to its plant for the manufacture of metal and wood patterns, to cost $30,000 with equipment. This firm operates an aluminum foundry.

Niagara Falls Smelting & Refining Corporation, Buffalo, N. Y., has appointed **C. W. Leavitt & Company,** New York, selling agents for its silicon copper and manganese copper, for the territory east of the Mississippi River.

The **Armstrong Cork & Insulation Company** announces changes in the addresses of its branch offices as follows: Denver, Colo., removed to 720-21 Symes Building; Kansas City, Mo., removed to 410 West Sixth street.

The **Cole Metal Products Company,** 330 East 23rd street, New York City, is erecting a new plant on Harris avenue, Long Island City, 100 x 200 ft. The plant is expected to be completed September 1st. Louis W. Cole is head.

The **Aluminum Cooking Utensil Company,** New Kensington, Pa., is moving its warehouse from a building that has been rented in Portland, Ore., to one that will be built for the company in the Emeryville district near Oakland, Calif.

The **American Electro Plating Company** has taken the entire upper part of building at 352 West 53rd street, New York. This firm operates plating, lacquering, polishing departments, tool room and cutting up shop, specializing in automobile work.

The **American Chemical Paint Company** announces that communications or shipments which have in the past been addressed to general offices and factory in Philadelphia, should in the future be addressed to American Chemical Paint Company, Ambler, Pa.

The **Aluminum Specialty Company,** Manitowoc, Wis., has under consideration the enlarging of its branch factory at Chilton, Wis., but no action will be taken for the time being. This firm operates a tool room, spinning, stamping and polishing departments.

The **Skinner Machinery Company,** Dunedin, Fla., manufacturer of packing house equipment, will make oil burning, steam and hot water boilers. This firm operates the following departments: brass and aluminum foundry, brass machine shop, tool room, casting shop, stamping.

The **International Nickel Company,** New York, for the year ended March 31, 1924, reports gross income of $3,025,654, against $1,282,271 in the previous fiscal year, and net profit of $1,206,786 after all expenses, taxes and reserves for depreciation and depletion, against net profit of $48,170 in the previous year.

Manufacturers' Foundry, Waterbury, Conn., has placed on each of its 150 employees life insurance protection of $1,000 and health and accident insurance providing for the payment of $10 weekly for 26 weeks in the event of illness or injury, under a group insurance plan arranged with the Metropolitan Life.

The **Rome Wire Company,** Rome, N. Y., is offering $1,000,000 7% cumulative sinking fund preferred stock. The company was incorporated in New York in 1905 and is one of the largest manufacturers in the United States of copper rods, copper wire, bare and insulated electrical copper wire and copper cables.

The **Buffalo Forge Company,** of Buffalo, N. Y., announces the opening of a new western office at Seattle, Wash. The territory of this office will include the States of Oregon, Idaho and Montana in addition to that of Washington and the Territory of Alaska. Arthur T. Forsyth of the Buffalo plant will be western representative in charge.

The **American Hardware Corporation,** New Britain, Conn., will erect a six-story addition to the Russell & Erwin division in that city. This firm operates the following departments: bronze, aluminum foundry, brass machine shop, tool room, grinding room, casting shop, cutting-up shop, plating, japanning, stamping, polishing, lacquering.

The **Crystal Silver Works,** 836-40 Kensington avenue, Buffalo, N. Y., incorporated with capital stock of $50,000, has taken over the business of the Crystal Silver Works, established two years ago, and will continue its business in the manufacture of silver plated hollow-ware. J. A. Watt heads the company. This firm operates the following departments: plating, stamping, soldering, polishing, lacquering.

Smith & Sons Corporation, Buffalo, N. Y., manufacturer of japanned wire pins and kindred products, is arranging for the early closing of its branch plant at Lambertville, N. J., and will remove the equipment to its local works, consolidating and increasing operations at this location. This firm operates the following departments: plating, japanning, polishing, lacquering.

The **Quality Aluminum Casting Company,** Waukesha, Wis., which was established about eight months ago, will enlarge its plant by the erection of a one-story brick and steel addition, 40 x 100 ft. The investment will be about $30,000 including additional equipment. A. C. Pankratz is president and general manager. This firm operates an aluminum foundry.

The **Michigan Copper & Brass Company,** 5851 West Jefferson street, Detroit, Mich., has completed plans and is taking bids for the erection of a 1-story addition at W. Jefferson and Ft. Wayne streets, 86 x 405 ft. It will be equipped primarily as a rolling mill, with estimated cost placed in excess of $150,000. This firm operates the following departments: tool room, casting shop, rolling mill.

Strand & Sweet Company, Winsted, Conn., wire insulators, which recently increased its capital from $50,000 to $100,000,

has purchased from E. P. Wilcox, approximately 15 acres on the Central New England Railway, where it is proposed to erect a 100 x 150 ft. manufacturing plant. The firm is adding to its equipment, cabling and twisting copper wire, also insulating all kinds of resistance wire.

The **Ornamental Iron & Bronze Company**, 338 Brown street, Philadelphia, Pa., manufactures ornamental brass and bronze work as required in the building trade, and specializes on metal banking screens. The company is in the market for supplies, such as brass, bronze, nickel, silver, Monel metal, brass tubes, sheets, lacquer polishing and grinding materials. Also for the equipment of brass and bronze foundry.

The **Wheeler Condenser & Engineering Company**, Carteret, N. J., has acquired the business of the **Alberger Pump & Condenser Company**, 140 Cedar street, New York, and will consolidate the organizations. The plant of the Alberger Company at Newburgh, N. Y., has become the Newburgh Works of the Wheeler Condenser & Engineering Company. This firm operates the following departments: brass foundry, casting shop.

The **Husky Wrench Company**, Milwaukee, Wis., has been incorporated with $50,000 capital stock. This company is to manufacture automotive and industrial wrenches, especially socket wrenches of the interchangeable type. Officers of the company are: Joseph O. Wirtish, president; John G. Zummach, secretary and treasurer; Siegmund Mandl, vice-president and chief engineer. Location of plant and offices are at 928 16th avenue.

Geo. Cady and **Leonard De Vos**, owners of the **Westwood Aluminum Foundry Company**, have pooled their interests with **Henry Buskers**, owner of the **Riverside Brass Foundry.** An addition has been built of 72 feet in length to the Riverside Brass Foundry, and is now in a position to take on both brass and aluminum work. The Westwood Aluminum Foundry Company is now out of existence, and the new place is known as the **Riverside Brass and Aluminum Foundry Company.**

Coincident with the opening of a new factory in the Vernon, Calif., industrial district, Charles H. Hermann, president of the **Republic Brass & Manufacturing Company**, Los Angeles, Calif., has announced the purchase by his company of the plant of the **W. T. Garratt Campany,** brass goods manufacturers of San Francisco, and the bringing of the machinery and equipment of that company to Los Angeles. Plans for adding two units are under consideration by officials of the company.

Hanson Manufacturing Company has made negotiations to move its factory from Cedar Falls to Waterloo, Iowa, where it will be located at 214 East 3rd street. The firm manufactures automobile bumpers and tourists trunks. A new nickel plating plant has been designed and will be installed here. The company operates the following departments: grinding room, plating, japanning, polishing, lacquering. The company is in the market for an 18" to 20" drill press and a punch press capable of punching ⅜" cold spring steel.

The **Westinghouse Electric & Manufacturing Company,** East Pittsburgh, Pa., reports net earnings of 18 per cent on the preferred and common stock for the year ended March 31 or $8.98 per share on the aggregate $89,775,150 stock outstanding during the year. In 1922 the company earned approximately 16 per cent on $74,812,650 of stock, or at the rate of $8.19 a share. For the last year net income available for dividends totaled $16,125,303 against $12,263,286. The company operates one of the largest brass foundries in the United States.

The **Bristol Company,** Waterbury, Conn., manufacturer of recording instruments and distributor of radio equipment, has leased space in the Larkin Building, 3617 S. Ashland avenue, Chicago, Ill., in order adequately to take care of the Middle West business. Most of the area will be devoted to repairing and recalibrating Bristol instruments sold and used in the Chicago territory, but some will be used for stock made-up instruments for quick deliveries and various lines of radio merchandise. The present salesroom and offices of the Bristol Company will be maintained in the Monadnock Building.

The **Standard Sanitary Manufacturing Company,** Bessemer Building, Pittsburgh, Pa., will soon take bids for a three-story factory branch and distributing works at Pratt and Senate streets, Indianapolis, Ind., 80 x 150 ft., estimated to cost $180,000 including equipment. The company is also preparing plans for a one-story and basement addition to its local plant at Sixth and Shipp streets, 135 x 180 ft., to be equipped as a foundry, estimated to cost $150,000 with machinery. This firm operates the following departments: smelting and refining, brass foundry, brass machine shop, tool room, plating, polishing.

The **Winchester Dehco Enameling Company** is a new concern which has opened up in Winchester, Ind. At the start the company expects to confine its attention to the refinish of automobiles, trucks, etc. The company has the exclusive right in this territory on a new and patented process whereby an entire car, including wheels and running gear, may be enameled in less than three days. A feature of the new process is the fact that enameling may be done in any desired color. The enamel can be used on wood as well as metal, and articles which have heretofore been painted cannot be given a more durable finish.

The **Newark Wire Cloth Company** is now established in a new plant at 351-365 Verona avenue, Newark, N. J. The new building is 100 feet wide by 310 feet long, covering approximately ¾ of an acre in floor area. Testing sieves, metallic filter cloth, foundry riddles, sifter cloths and straining cloths will briefly cover their products. In the new plant Newark wire cloth is now being made of all metals such as aluminum, brass, copper, bronze, silver, gold, platinum, phosphor bronze, nickel, steel, monel metal, nichrome, and special alloys, and they are making all meshes from one space to every 2 inches to 325 meshes to an inch.

Judge Thompson of the United States District Court, Eastern District of Pennsylvania, signed a decree on April 28, 1924, dismissing the **American Bronze Corporation,** Berwyn, Pa., from the receivership under which the corporation has been operating since August 8, 1923. The business is now restored to its stockholders and corporate control, and all creditors will receive one hundred cents on the dollar. The new Board of Directors includes: Philip E. Guckes, president, Integrity Trust Company, Philadelphia, Pa.; George M. Huey, president, Denny Tag Company, West Chester, Pa.; William F. Fischer, president, Fischer Machine Company, Philadelphia, Pa.; S. B. Rheam, president, Central Boiler, Tank and Plate Works, Pittsburgh, Pa.; E. G. Anderson, Berwyn, Pa. The officers are: E. G. Anderson, president; William F. Fischer, vice-president; G. Willard Frame, treasurer; John C. Smith, secretary. During the nine months of receivership the business has been operated at a substantial profit, a condition rather unusual in such matters.

INCORPORATIONS

The **Early Porcelain Enamel Company,** Brooklyn, N. Y., has been incorporated for $20,000 to do porcelain enameling on sheet metal and cast iron, by J. N. Early, T. Schwartz, L. Dierke.

The **Viking Pump Company,** Walkerville, Ont., Can., has been incorporated in Canada for $40,000 to manufacture the Viking rotary pump together with a number of auto accessories. These pumps are made entirely of metal, either iron or bronze. This firm will operate a machine shop and cutting-up shop.

The **Laetz Foundry,** Bay City, Mich., has been organized to manufacture gray iron, brass and aluminum castings, having taken over the business formerly conducted by the Chris Laetz Foundry. W. S. Cooley is manager and Chris Laetz is superintendent. This concern operates the following departments: bronze and aluminum foundry, brass machine shop, tool room, grinding room, plating, brazing.

The **Lally Fire Appliance Company,** 109 Shipley street, Wilmington, Del., has been incorporated with $100,000 capital stock to take over the business of the Wilmington Brass Company, manufacturer of chemical tanks, hose couplings, fire extinguishers and specialties in brass work. The company will still do business under the name of the Wilmington Brass Company. This firm operates the following departments: brass machine shop, tool room, grinding room, soldering, polishing, lacquering.

UNION CARBIDE CLEARED

The so-called "carbide case," which has occupied the time of the United States District Court for five weeks, came to an abrupt ending May 9, 1924, when Judge Morris A. Soper took the case away from the jury by directing it to return a verdict for the defense.

The suit was brought by the Alexander Milburn Company of Baltimore, Md., against the Union Carbide and Carbon Corporation of New York, six alleged affiliated companies and the Davis-Bournonville Company, New York, for $2,250,000 damages for alleged conspiracy to violate anti-trust laws. After reviewing the testimony, the Court said in part:

"The inevitable conclusions from a recital of the testimony is that the plaintiff failed in both branches of the conspiracy charged. The evidence not only failed to establish an agreement between the defendants for the allotment of Government business to one defendant and the railroad business to the other party to the conspiracy, but the evidence affirmatively shows that each of the parties to the alleged conspiracy actively and energetically endeavored to secure business in the field forbidden to it under the terms of the alleged combination.

Counsel for the Milburn company announced that the case will be appealed to the United States Circuit Court of Appeals at Richmond, Va. The grounds for the appeal will be, he said, that Judge Soper excluded certain evidence which, counsel contended, should have been admitted.—The New York Times, May 10, 1924.

SMELTING AND REFINING MERGER

A merger of several of the largest metal smelters and refiners has been concluded to form the Federal Metals Corporation. This will embrace the following companies: Great Western Smelting & Refining Company; Duquesne Reduction Company, Pittsburgh; Eagle Smelting and Refining Company, New York; Union Smelting and Refining Company, Newark, N. J., and the Trenton Smelting and Refining Company, Trenton, N. J. An issue has been floated of $4,000,000, 15 year, 7 per cent convertible bonds, and 400,000 shares of common stock, no par value.

The largest of these constituent companies, the Great Western Smelting & Refining Company, now operates plants in St. Louis, Chicago, Detroit, Seattle and San Francisco. The total annual sales of all the companies have averaged over 38 million dollars per year for the past nine years, according to the announcement of B. Lissberger & Co., 233 Broadway, New York. Assets are said to be over 14 million dollars. Officers are as follows: David Blum, chairman of the board; Benjamin Lissberger, president; Ivan Reitler, Leon Falk, Maurice Falk, Henry Lissberger and Samuel Jacobson, vice-presidents; I. Simons, secretary; Max Lissberger, treasurer. These men, together with L. D. Waixel, Perry Osborne, Stanhope Goddard and Charles M. Schwab, will form the directorate.

All the plants now owned by these companies will be continued in operation and a new plant will be built next to the Union Smelting and Refining works in Newark, to be used as a warehouse for new and old metals.

CANADIAN METAL INDUSTRY

More than $100,000,000 was invested in Canadian plants manufacturing products from metals outside of iron or steel in 1922. The value of the production was $70,855,693, according to the Dominion Bureau of Statistics, a decrease of 2.5% from 1921.

ANACONDA COMPANY OUTPUT

Anaconda Copper Mining Company reports net income for 1923 of $8,767,814 after interest, taxes, depreciation and other charges as against $3,530,877 in 1922. Gross income was $227,836,790 against $175,450,384 in 1922; $50,930,594 in 1921 and $100,295,167 in 1920.

In his annual report, Chairman John D. Ryan estimated world production at 2,700,000,000 pounds and consumption at 2,600,000,000, both records for any peace year. Domestic apparent consumption was 1,376,000,000 pounds, compared with 1,104,000,000 in 1922, increase of approximately 25%.

CHILE COPPER STATISTICS

The Chile Copper Company for 1923 reports net income of $15,026,680 after taxes and interest charges as against $4,886,954 in 1922.

According to the report of Chairman John D. Ryan there was a total of 204,897,590 pounds produced last year at an average cost of 8.1 cents per pound delivered after depreciation, taxes, interest and discount on bonds.

AMERICAN BRASS STATISTICS

The output of manufactured products of the various plants of the American Brass Company equalled 505,518,834 pounds of copper, brass and nickel silver.

Production consisted of:

Sheet metal	213,837,564
Rods and wire	206,136,895
Tubes	41,704,287
Miscellaneous	43,840,088
	505,518,834

Manufactured at:

Ansonia	178,150,189
Buffalo	60,388,146
Hastings	22,420,180
Kenosha	68,113,869
Torrington	59,019,754
Waterbury	107,750,087
Toronto	9,676,609
	505,518,834

A copper wire mill, which will have a monthly capacity of 5,000,000 pounds of bare wire, is under construction at Kenosha, Wis.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$519	$550
American Hardware Corporation	100	63½	65
Anaconda Copper	50	29¼	29½
Bristol Brass	25	..	9
International Nickel, com	25	11⅞	12
International Nickel, pfd	100	76	77¼
International Silver, com	100	100	120
International Silver, pfd	100	103	107
National Enameling & Stamping	100	22¾	23½
National Lead Company, com	100	130	132
National Lead Company, pfd	100	110½	111
New Jersey Zinc	100	135	139
Rome Brass & Copper	100	135	145
Scovill Manufacturing Company, new	..	210	225
Yale & Towne Mfg. Company, new	..	63	66

Corrected by J. K. Rice, Jr., Co., 36 Wall street, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

The weakness in the price of ingot copper during the month of May was reflected in the prices of fabricated brass and copper materials such as rods, tube, sheet and wire, with the result that those products are now selling on a basis that is almost as low as any price level that has been reached since the war. There has been a decided falling off in consumption of these materials, and this fact coupled with the uncertainty in price conditions, has resulted in a very definite

hand-to-mouth buying policy on the part of consumers. Most of the mills are operating on the four day schedule, and some of them with reduced forces. It cannot be said that there is a great amount of optimism prevailing throughout the trade, but, at the same time, there is a feeling that this situation cannot last very long, and that fundamentally the position is strong enough to justify the belief that there will shortly be a turn in the tide.

Stocks are at a low level and any improvement in general business conditions would probably find immediate response in the metal market. As prices appear, at this time, to be at a level which would justify the belief that they cannot go much, if any, lower, the feeling is that there is only one direction in which they can move and that is upward. No one seems to be willing to hazard a guess, however, as to when an improvement is likely to occur.

In the branch of the non-ferrous metal industry covering nickel-silver, pure nickel, Monel metal and other nickel alloys, there has been some reaction in the volume of business placed, but in specific lines such as Monel metal, the new uses which have been uncovered for the product have to some extent neutralized the effect of the falling-off in general business, and the Monel metal business still continues to go forward at a very satisfactory pace. The number of new hotels and restaurants that have been built, many of which have recently approached the final stages, have been responsible for a large consumption of Monel metal. The kitchens have been equipped with Monel metal; dishwashers, sinks, drainboards, trim, work-tables, cupboards, storage cabinets are now all made with metal parts of Monel metal. Another item of interest to the trade is the tremendous consumption of both sheet copper and Monel metal in the construction of self-refrigerating ice cream cabinets.

There have been recently put on the market several storage cabinets for ice cream which have a small ice machine attached, and which do away entirely with the need for cracked ice such as has been heretofore used in connection with ice cream storage tanks.

These are just a few illustrations of items of interest to the non-ferrous trade which have lately become very important as consuming factors. The point to be made in the mention of these developments, is, that through many lines of industry there have been new uses and new applications found for non ferrous metal which should make for a very large volume of consumption with the return of business to anything like normal conditions.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

The easy state of the copper market continued to be the conspicuous feature throughout the entire month of May. Trading in the metal was largely confined to a moderate volume of sales from day to day at the lowest prices established since February. The weakness of the market was early apparent, and the pressure to sell forced prices to the low level of 12½c to 12⅝c, although there was a slight turning of the market that put prices at 12¾c delivered.

Statistics for the month of April gave indication of further shrinkage in surplus stocks. These were reduced to 221,000,000 pounds on May 1st, as compared with 240,000,000 pounds on April 1st, but this substantial reduction in floating supplies absolutely failed to effect any market betterment.

ZINC

The zinc situation showed recent statistical improvement due to carrying out of curtailment plans by some large operators, but there is lack of buying support on a scale to stimulate market prices. Present prices are quoted at 5.80 cents East Et. Louis and 6.15 cents New York. An occasional rally of small proportions appeared during May, but consuming demand was not broad enough to lift the market out of its depressed condition. Export basis was below the domestic equivalent lately, but a better trade inquiry is looked for from domestic and foreign buyers. European advices show that American zinc has been in close competition with the Belgian.

TIN

Sharp price recessions and pronounced depression were outstanding features in the tin market during the last 30 days. Straits tin declined 7¾ cents a pound between May 1st and 31st in the New York market and Banka and Chinese in same proportion. Falling off in American consumption and less aggressive speculative manipulation by the London bull operators were held responsible for the downward movement.

The lack of confidence in the extraordinary prices demanded for tin created a degree of apprehension in trade circles which effectually checked the wild speed to force prices skyward. June opened with a London advance of £4 5s over the May closing and at 40¼ cents to 40⅞ cents for Straits June and July shipments. The tone of market here was quiet.

The domestic deliveries of imported tin during the month of May amounted to 5,240 tons, against 7,590 tons in April. Total American deliveries of foreign tin during the first five months of this year were 31,130 tons as compared with 32,254 tons during the first five months of 1923, a decrease of 1,124 tons. Stocks of tin reported in warehouse and on dock at New York on May 30th amounted to 4,067 tons, against 4,322 tons on April 30th. Tin carried in warehouse at New York on May 30th, however, amounted to 1,567 tons as compared with only 392 tons on April 30th. The large increase in warehouse stocks is regarded as an unfavorable feature as showing a restricted outlet for spot supplies.

LEAD

There was a gradual lowering of the price of lead last month. The price on May 1st was 8 cents for New York delivery, and the present basis is 7 cents. There were four price reductions of one-quarter cent each in May by the American Smelting & Refining Co. The downward tendency of the market was fully expected before the inflated values began to sag on outside offerings. Consumption is still good in some branches of industry, but in certain directions requirements have diminished from the former high levels of a few months ago. Current prices have attracted buyers recently, and concessions from present level of quotation is doubtful for the time being.

ALUMINUM

Prices of aluminum for shipments over second-half of the year quote 28 cents for virgin 99% plus and 26½ cents to 27 cents for 98-99% material. There is some falling off in consumption owing to less demand from motor manufacturers. Cable and other requirements, however, have been on a fair scale. The leading domestic producer is said to be taking orders recently for second-half of year at current basis. Importers have also booked a good line of business. Imports of aluminum into the United States for the nine months ended March 31, 1924, were 32,029,063 pounds as against 30,852,739 pounds in corresponding period of 1923. Current prices are steady and compare with the average price for 1923 of 25.41 cents for 98-99% pure metal.

ANTIMONY

The market for antimony continued to weaken lately and the New York market offers supplies at 6½ cents in bond for resale metal, or 8½ cents duty paid. Alhough Chinese merchants have material to sell, the foreign price is higher than that of local sellers. Demand is quiet, and the effect of spot offerings was to keep the market easy.

Imports of antimony regulus at New York from January 1 to May 23, 1924, amounted to 2,887 tons, as compared with 1,636 tons January to May, inclusive, in 1923. Total imports of antimony regulus in 1923 were 7,813 tons. Recent Chinese cables quoted 6⅞ cents c. i. f., New York.

QUICKSILVER

The statistical position of quick silver is considered strong and sales were made recently around $77 to $78 a flask. The price has dropped to $75 within a short time owing to quiet demand. Recent London cables quoted £13 5s per flask against £14 some time ago. High prices has stimulated domestic production, but world supply is considered below consumption.

PLATINUM

Refined platinum continues to quote $115 per ounce, but this is considered top figure. Recent demand was confined to limited amounts and with freer offerings the market is in favor of buyers.

SILVER

Silver prices on June 2nd advanced to 67 cents an ounce, a new "high" for this year. This price compares with a "low" of 62.8 in 1924. There has been a much larger demand for silver lately for Continental account. Imports into this country also fell off to less than four million dollars in April, against more than six million in March and nearly eight million dollars in February. Should the agitation in favor of the Treasury purchasing the 14,589,730 ounces of domestic silver at $1 an ounce succeed as per Senator Pittman's Bill, it will probably prove a factor in sending the market higher. Mexico is reported using larger amounts of silver for currency requirements which is one reason for the decrease in imports. Producers are more hopeful for future of market.

OLD METALS

The market for scrap metals has experienced more or less unsettlement in sympathy with lower prices for the virgin metals, copper and lead. Dealers hesitate stocking up except at concessions and consumers also also exercise considerable caution in buying freely. With any recovery in primary metals stiffen prices and increased activity would result in scrap material. Dealers buying prices quote nominally at 10 cents to 10½ cents for heavy copper scrap, 10½ cents to 11 cents for strictly crucible copper, 5¾ cents to 6½ cents for heavy brass, 8 cents to 8½ cents for new brass clippings, mill stock, 5½ cents to 5¾ cents for heavy lead, 4¼ cents to 4¾ cents for new zinc scrap, 20 cents to 21 cents for aluminum clippings, and 3⅝ cents to 3¾ cents for battery lead.

WATERBURY AVERAGE

Lake Copper—Average for 1923, 14.979—January, 1924, 13.00—February, 13.125—March, 13.875—April, 13.625—May, 13.25.

Brass Mill Zinc—Average for 1923, 7.479—January, 1924, 7.25—February, 7.50—March, 7.25—April, 7.00—May, 6.60.

Daily Metal Prices for the Month of May, 1924

Records of Daily, Highest Lowest and Average

	1	2	5	6	7	8	9	12	13	14	15	16
Copper (f. o. b. Ref.) c/lb. Duty Free												
Lake (Delivered)	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.375	13.375	13.375	13.25	13.25
Electrolytic	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.20	13.10	13.05	12.95	12.75
Casting	13.00	13.00	13.00	13.00	13.00	12.75	12.75	12.625	12.50	12.50	12.50	12.375
Zinc (f. o. b. St L.) c/lb. Duty 1¼c/lb.												
Prime Western	5.80	5.85	5.85	5.85	5.80	5.75	5.75	5.85	5.85	5.85	5.85	5.80
Brass Special	5.95	6.00	6.00	6.00	5.95	5.90	5.90	6.00	6.00	6.00	6.00	5.95
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	48.00	48.625	48.125	47.50	46.875	46.375	47.00	47.50	46.00	45.75	44.00	43.00
Pig 99%	47.375	47.875	47.375	46.875	46.125	45.625	45.25	46.75	45.375	45.00	43.50	42.25
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	7.625	7.50	7.50	7.375	7.15	7.10	7.10	7.15	7.10	7.125	7.05	7.00
Aluminum c/lb. Duty 5c/lb.	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Nickel c/lb. Duty 3c/lb.												
Ingot—Internat. Nick. Co.	28	28	28	28	28	28	28	28	28	28	28	28
Outside Spot	27	27	27	27	27	27	27	27	27	27	27	27
Electrolytic (Internat. Nick. Co.)												
Ni.—99.80 contam. impur.—.14	30	30	30	30	30	30	30	30	30	30	30	30
Brit.-Amer. Nick. Corp.												
Ni.—98.50 contam. impur.—.80	28	28	28	28	28	28	28	28	28	28	28	28
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	9.25	9.25	8.80	8.75	8.50	8.50	8.50	8.375	8.40	8.75	8.75	8.75
Silver c/oz. Troy Duty Free	64.125	64.625	64.25	64.25	64.50	64.75	65.25	65.25	65.125	65.25	65.125	65.375
Platinum $/oz. Troy Duty Free	115	115	115	115	115	115	115	115	115	115	115	115

	19	20	21	22	23	26	27	28	29	30*	High	Low	Aver.
Copper (f. o. b Ref.) c/lb. Duty Free													
Lake (Delivered)	13.25	13.25	13.00	13.00	12.875	12.875	12.875	12.875	12.875	.....	13.50	12.875	13.238
Electrolytic	12.875	12.95	12.75	12.65	12.65	12.65	12.65	12.65	12.65	.....	13.25	12.65	12.965
Casting	12.625	12.625	12.625	12.50	12.375	12.375	12.375	12.375	12.375	.....	13.00	12.375	12.631
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	5.80	5.75	5.70	5.65	5.65	5.70	5.80	5.80	5.80	.....	5.85	5.65	5.786
Brass Special	5.95	5.90	5.85	5.80	5.75	5.80	5.90	5.90	5.90	.....	6.00	5.75	5.924
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	41.25	40.625	41.25	40.75	40.00	41.00	41.375	41.75	40.75	.....	48.625	40.00	44.167
Pig 99%	40.50	40.00	40.50	40.00	39.50	40.50	40.875	41.25	40.25	.....	47.875	39.50	43.512
Lead (f. o. b. St, L.) c/lb. Duty 2½c/lb.	7.00	6.95	6.85	6.75	6.65	6.70	6.80	6.70	6.70	.....	7.625	6.65	7.042
Aluminum c/lb. Duty 5c/lb.	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	.....	28.00	28.00	28.00
Nickel c/lb. Duty 3c/lb.													
Ingot—Internat. Nick. Co.	28	28	28	28	28	28	28	28	28	.....	28	28	28
Outside Spot	27	27	27	27	27	27	27	27	27	.....	27	27	27
Electrolytic (Internat. Nick. Co.)													
Ni.—99.80 contam. impur.—.14	30	30	30	30	30	30	30	30	30	.....	30	30	30
Brit.-Amer. Nick. Corp.													
Ni.—98.50 contam. impur.—.80	28	28	28	28	28	28	28	28	28	.....	28	28	28
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	8.70	8.65	8.65	8.65	8.65	8.50	8.50	8.50	8.50	.....	9.25	8.375	8.661
Silver c/oz. Troy Duty Free	66.00	66.50	66.625	66.875	66.50	66.25	66.125	66.25	66.50	.....	66.875	64.125	65.500
Platinum $/oz. Troy Duty Free	115	115	115	115	115	115	115	115	115	.....	115	115	115

*Holiday.

Metal Prices for June 9, 1924

Copper: Lake, 12.875. Electrolytic, 12.75. Casting, 12.50
Zinc: Prime Western, 5.85. Brass Special, 5.95.
Tin: Straits, 42.00. Pig, 99%, 41.375.
Lead: 7.00. **Aluminum,** 28.00. **Antimony,** 8.40.
Nickel: Ingot, Internat, Nickel Co., 28. Outside spot, 27. Electrolytic, Internat. Nick. Co., 30. Brit. Am. Nick. Corp., 28.
Quicksilver, flask, 75 lbs., $76. **Silver,** oz. Troy, 67.00. **Platinum,** oz. Troy, $116. **Gold,** oz. Troy, $20.67.

Metal Prices, June 9, 1924

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	9¼to10
Brass Ingots, Red	11 to12
Bronze Ingot	12 to13
Bismuth	$2.50
Cadmium	60 to65
Casting Aluminum Alloys	21 to24
Cobalt—97% pure	$2.75
Manganese Bronze Castings	22 to35
Manganese Bronze Ingots	11 to16
Manganese Bronze Forging	33 to42
Manganese Copper, 30%	28 to45
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	17½to20
Phosphor Copper, guaranteed 10%	17 to20
Phosphor Tin, guaranteed 5%	50 to55
Phosphor Tin, no guarantee	47 to53
Silicon Copper, 10%...according to quantity	28 to35

OLD METALS

Buying Prices		Selling Prices
10¾to11	Heavy Cut Copper	12¼to12¾
10¼to10½	Copper Wire	11¾to12
8¾to 9	Light Copper	10 to10½
8¾to 9	Heavy Machine Comp.	10½to10¾
6½to 6¾	Heavy Brass	8¾to 9¼
5¼to 5¾	Light Brass	6½to 7
6¾to 7	No. 1 Yellow Brass Turnings	7½to 8½
8 to 8½	No. 1 Comp Turnings	9¼to 9½
5¼to 5¾	Heavy Lead	5¾to 6
2¼to 3	Zinc Scrap	3¼to 3¾
7¾to 8¼	Scrap Aluminum Turnings	10¼to10¾
13¾to14¼	Scrap Aluminum, cast alloyed	15¾to16¼
14¼to15¾	Scrap Aluminum, sheet (new)	15¾to17¾
21¼	No. 1 Pewter	25¾
12¾	Old Nickel anodes	14¾
20¼to22¼	Old Nickel	24¾to27¼

BRASS MATERIAL—MILL SHIPMENTS

In effect May 16, 1924.

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.16¾	$0.18½	$0.20½
Wire	.17¼	.19	.21
Rod	.14½	.19¼	.21¼
Brazed tubing	.24¾	.....	.30¼
Open seam tubing	.24¾	.....	.30¼
Angles and channels	.27¾	.....	.33¼

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.17¾	$0.19½	$0.21½
Wire	.18¼	.20	.22
Rod	.15½	.20¼	.22¼
Brazed tubing	.25¾	.....	.31¼
Open seam tubing	.25¾	.....	.31¼
Angles and channels	.28¾	.....	.34¼

SEAMLESS TUBING

Brass, 21c to 22c net base.
Copper, 22¼c to 23¼c net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	18¾c net base
Muntz or Yellow Metal Sheathing (14" x 48")	16¾c net base
Muntz or Yellow Rectangular Sheets other Sheathing	17¾c net base
Muntz or Yellow Metal Rod	14¾c net base

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	19¾c to 21¾c net base
From stock	20¼c to 22¼c net base

BARE COPPER WIRE—CARLOAD LOTS

15½c to 15⅝c net base.

SOLDERING COPPERS

300 lbs. and over in one order	19c net base
100 lbs. to 200 lbs. in one order	19½c net base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 9½c basis less 8 per cent discount.

Casks, jobbers' prices	10¾c net base
Open casks, jobbers' prices	11¼c to 11½c net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	40c.
Aluminum coils, 24 ga. and heavier, base price	36-70c.
Foreign	38-40c.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Nickel Silver Sheet Metal

10%	Quality	24c
15%	"	25¼c
18%	"	26¼c

Nickel Silver Wire and Rod

10%	"	27¼c
15%	"	30½c
18%	"	33½c

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	48
Hot Rolled Sheets (base)	42

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheets—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 70c. to 72c. per Troy ounce, depending upon quantity.

Rolled sterling silver 67¼c. to 69¼c.

NICKEL ANODES

85 to 87% purity	37½c.–39½c. per lb.
90 to 92% purity	40c.–42c. per lb.
95 to 97% purity	42c.–44c. per lb.

Supply Prices, June 9, 1924

CHEMICALS

In Commercial Quantities—New York Prices

Acetone	lb.	.15–.16½
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg. Carboys	lb.	.06
Nitric, 42 deg. Carboys	lb.	.07
Sulphuric, 66 deg. Carboys	lb.	.02
Alcohol—		
Butyl	lb.	.30–.35
Denatured in bbls	gal.	.50–.55
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech	lb.	.02½–.03
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—		
Sulphate, tech, Barrels	lb.	.03¼
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, Kegs	lb.	.16
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.05½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.07
Chrome Green, bbls.	lb.	.36
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, Barrels	lb.	.18
Cyanide	lb.	.48
Sulphate, Barrels	lb.	.05¼
Copperas (Iron Sulphate, bbl.)	lb.	.02
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.50
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.59–.61
Iron, Sulphate, see Copperas, bbl	lb.	.02
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	1.15
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.22¼
Salts, single bbls	lb.	.10½
Salts, double, bbl	lb.	.10
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% fused, drums	lb.	.08¼
Potassium Bichromate, casks	lb.	.09¼
Carbonate, 80-85%, casks	lb.	.05¼
Cyanide, 165 lb. cases, 94-96%	lb.	.65
Pumice, ground, bbls	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls	lb.	.03
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.46
Soda Ash, 58%, bbls	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.05½
Cyanide, 96 to 98%, 100 lbs	lb.	.22
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls	lb.	.04¼
Phosphate, tech., bbls	lb.	.03½
Silicate (Water Glass) bbls	lb	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.13
Sulphur (Brimstone) bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.32½
Tripoli, Powdered	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls	lb.	.02
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.35
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls	lb.	.13–.17
Chloride, 600 lb. lots	lb.	.07
Cyanide	lb.	.39
Sulphate, bbls.	lb.	.03¼

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base, 40.85
14 inch, 20 ply, 64/68, cloth	base, 50.80
12 inch, 20 ply, 84/92, cloth	base, 46.20
14 inch, 20 ply, 84/92, cloth	base, 62.25
12 inch, 20 ply, 88/96, cloth	base, 63.25
14 inch, 20 ply, 88/96, cloth	base, 85.15
Sewed Buffs, per lb., bleached and unbleached	base, .65 to .75

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.	300 Lbs. and Over
Diameter—10" to 16"	1" to 3"	2.75	2.50
" 6" 8" and over 16"	1" to 3"	2.85	2.60
" 6" to 24"	Over 3"	3.15	2.80
" 6" to 24"	½" to 1"	3.75	3.50
" 4" to 6"	¼" to 3"	4.75 }	Any quantity
" Under 4"	¼" to 3"	5.35 }	

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.